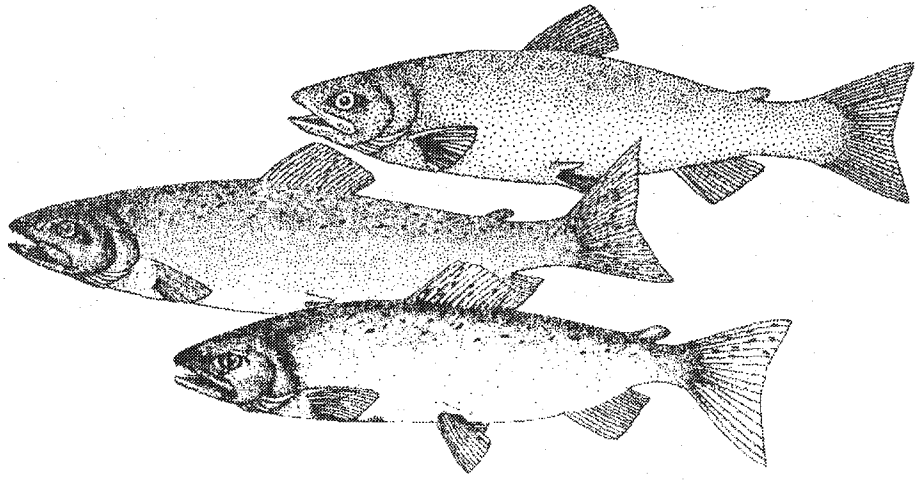
Pacific Salmon Spawning Escapement Goals for the Prince William Sound, Cook Inlet, and Bristol Bay Areas of Alaska

by

Stephen M. Fried



SPECIAL PUBLICATION NO. 8

Alaska Department of Fish and Game
Commercial Fisheries Management
and Development Division
Juneau, Alaska

December 1994

State of Alaska
Tony Knowles, Governor

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PACIFIC SALMON SPAWNING ESCAPEMENT GOALS FOR THE PRINCE WILLIAM SOUND, COOK INLET, AND BRISTOL BAY AREAS OF ALASKA

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Special Publication No. 8

Alaska Department of Fish and Game
Commercial Fisheries Management and Development Division
P.O. Box 25526
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December 1994

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ACKNOWLEDGMENTS

I would like to acknowledge the dedication, hard work and foresight of the many biologists who, over the years, have labored to collect and compile the information upon which the escapement goals in this report are based. Dennis Haanpaa and James Brady, Regional Management Biologists in the Commercial Fisheries Management and Development Division (CFMD), and Douglas McBride, Regional Research Biologist in the Sport Fish Division (SF), coordinated the compilation of escapement data for the management areas and species under their supervision. The information they provided was obtained with the assistance of the following individuals: Tom Brookover (CFMD), Wesley Bucher (CFMD), Beverly Cross (CFMD), Wayne Donaldson (CFMD), Lee Hammarstrom (CFMD), Steven Hammarstrom (SF), Kelly Hepler (SF), Andrew Hoffman (SF), Robert "Mac" Minard (SF), Steven Morstad (CFMD), David Nelson (SF), Jeffrey Regnart (CFMD), Paul Ruesch (CFMD), Richard Russell (CFMD), Samuel Sharr (CFMD), Kenneth Tarbox (CFMD), Jeffrey Skrade (CFMD), Craig Whitmore (SF), John Wilcock (CFMD), and Henry Yuen (CFMD). Along with all the above named individuals, I would also like to thank Linda Brannian (CFMD) for her helpful discussions and review of various sections of this report. I accept full responsibility for any errors of omission or interpretation.

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BACKGROUND AND SUMMARY

Attainment of spawning escapement goals, while allowing for the orderly harvest of salmon surplus to these goals in commercial, recreational, personal use and subsistence fisheries, is the principal objective used by the Alaska Department of Fish and Game (ADF&G) for managing Pacific salmon *Oncorhynchus* resources. This report documents existing spawning goals for wild, anadromous Pacific salmon returning to spawning systems within the Prince William Sound, Cook Inlet, and Bristol Bay management areas, which are included within Region II of both the Commercial Fisheries Management and Development and Sport Fish Divisions of ADF&G (Figure 1).

In 1992, the Alaska Department of Fish and Game (ADF&G) adopted a *Salmon Escapement Goal Policy* that established a formal process to set new escapement goals as well as to evaluate and modify existing escapement goals (Appendix A.1). Publication of escapement goals was established as part of this process, and goals were classified as (1) biological escapement goals, which produce maximum sustained yield and are set by ADF&G; (2) optimal escapement goals, which consider allocative factors and are set through regulations by the Alaska Board of Fisheries; or (3) in-river goals, which define specific allocations to fisheries occurring above the point where escapement is estimated and which are also set through regulations by the Alaska Board of Fisheries. Escapement levels at which explicit management actions are taken, usually to ensure optimal goals are reached, are termed *action points*. It was sometimes difficult to classify existing goals according to current policy definitions because these goals were set prior to adoption of the policy, and the history of their development has not always been well documented. For the purpose of this report, goals not adopted under regulatory management plans are defined as *biological escapement goals*, while goals set out in such plans are defined as *optimal escapement* and *in-river goals*. Because ADF&G routinely restricts harvests to ensure escapement goals are met, only action points set forth in regulatory management plans have been reported. The term *stock* in this report refers to a group of salmon managed as a unit which may spawn within (1) a single creek or stream, (2) a portion of a river drainage, (3) an entire river drainage, or (4) within several creeks, streams, and rivers occurring in a management district. For the areas covered in this report, biological escapement goals have been established for 172 salmon stocks: 29 chinook *O. tshawytscha*, 21 chum *O. keta*, 12 coho *O. kisutch*, 40 even-year pink *O. gorbuscha*, 39 odd-year pink, and 31 sockeye *O. nerka* salmon stocks. Optimal goals have been established for 4 chinook, 1 coho, and 4 sockeye salmon stocks; in-river goals have been set for 1 chinook, 1 coho, and 1 sockeye salmon stocks; and action points have been specified for 4 chinook, 1 coho, and 8 sockeye salmon stocks. Escapement enumeration methods for salmon stocks covered in this report are based on (1) aerial surveys for 89 stocks; (2) foot surveys for 40 stocks; (3) a combination of aerial and foot surveys for 15 stocks; (4) hydroacoustic assessments for 11 stocks; (5) weir counts for 9 stocks; (6) tower counts for 7 stocks; and (7) a combination of foot surveys and weir counts for 1 stock.

Criteria used for assigning an existing goal to one of the policy definitions have been explained within the Methods section of this report. Similarly, criteria used to aggregate salmon into stocks for the purpose of setting escapement goals have also been included within the Methods section.

MANAGEMENT AREAS

Prince William Sound

For commercial salmon fisheries, the Prince William Sound area includes all coastal waters and inland drainages flowing into the northcentral Gulf of Alaska west of the longitude of Cape Suckling (143° 53' W) and east of the longitude of Cape Fairfield (148° 50' W). This area includes the Bering and Copper Rivers as well as hundreds of smaller creeks, streams, and rivers (Figure 2). The area is subdivided into 11 management districts that correspond to local geography and the distribution of salmon spawning drainages: Bering River, Copper River, Coghill, Unakwik, Eshamy, Eastern, Northern, Northwestern, Southwestern, Southeastern, and Montague Districts. Additionally, these districts have been subdivided into 47 smaller management units to facilitate discrete stock management, including special harvest areas used to aid in the harvest of hatchery-produced salmon.

For recreational fisheries, this same geographic area is included within 2 management units. The Prince William Sound area includes all waters of the Gulf of Alaska and its drainages west of the longitude of Cape Suckling and east of the longitude of Cape Puget (148° 26' 30" W), excluding the Copper River drainage upstream of a line crossing the Copper River between the south bank of the confluence of Haley Creek and the south bank of the confluence of Canyon Creek in Wood Canyon. Waters upstream of this line are included in the Upper Copper-Upper Susitna River area.

For commercial salmon fisheries, purse seines, drift gillnets and set gillnets are the only legal gear, although not all gear types are permitted within each district. For recreational salmon fisheries, a single line, closely attended, having attached to it not more than 1 plug, spoon, spinner or a series of spinners, or 2 flies, or 2 hooks is the only legal gear. For personal use salmon fisheries, dip nets and fish wheels are the only legal gear. For subsistence salmon fisheries, gillnets and seines in marine waters and dip nets and fish wheels in fresh waters are the only legal gear.

Cook Inlet

For commercial salmon fisheries, the Cook Inlet area includes all coastal waters and inland drainages west of the longitude of Cape Fairfield and north of the latitude of Cape Douglas (58° 52' N; Figure 3). This area has been subdivided into upper and lower management units at the latitude of Anchor Point (59° 46' 12" N). Upper Cook Inlet includes the largest river drainages—Susitna, Kenai, and Kasilof Rivers—while Lower Cook Inlet includes hundreds of smaller rivers, creeks, and streams. Upper Cook Inlet is subdivided into 2 salmon fishing districts—Northern and Central—which have been further subdivided into 8 subdistricts to facilitate discrete stock management. Lower Cook Inlet is subdivided into 4 salmon fishing districts—Eastern, Outer, Southern, and Kamishak Bay—which have been further subdivided into 30 subdistricts and sections to facilitate discrete stock management.

For recreational fisheries, this same area is included within 4 management units. The Cook Inlet-Resurrection Bay Saltwater area includes all marine waters south of Cape Puget and east of Cape Douglas. Freshwater drainages within this geographic area are contained within 3 management units. The Kenai Peninsula area includes all freshwater drainages of the Kenai Peninsula west of a line from Cape Puget to the west bank of the mouth of Ingram Creek (excluding Ingram Creek). The Susitna-West Cook Inlet area includes all freshwater drainages which flow into Cook Inlet, Kamishak Bay, and contiguous bays north of the latitude of Cape Douglas, excluding the Kenai Peninsula and Upper Susitna drainage upstream of the confluence of the Oshetna River. The Upper Copper-Upper Susitna area includes all waters and drainages of the Upper Susitna River upstream from the confluence of Oshetna River.

For commercial salmon fisheries, purse seines, drift gillnets, and set gillnets are the only legal gear, although not all gear types are permitted within each district. For recreational salmon fisheries, a single line, closely attended, having attached to it not more than 1 plug, spoon, spinner or a series of spinners, or 2 flies, or 2 hooks is the only legal gear for recreational fisheries. For personal use salmon fisheries, set gillnets in marine waters and dip nets in fresh waters are the only legal gear. For subsistence salmon fisheries, set gillnets in marine waters are the only legal gear.

Bristol Bay

For commercial as well as recreational salmon fisheries, the Bristol Bay area includes all coastal waters and inland drainages east of a line from Cape Menshikof to Cape Newenham (Figure 4). The area has been divided into 5 commercial salmon fishing districts which generally correspond to the major river systems: Ugashik, Egegik, Naknek-Kvichak, Nushagak, and Togiak. These districts have been further subdivided into 10 sections to further facilitate discrete stock management.

For commercial salmon fisheries, drift and set gillnets are the only legal gear, and both gear types are permitted within each district. For recreational salmon fisheries, a single line, closely attended, having attached to it not more than 1 plug, spoon, spinner or a series of spinners, or 2 flies, or 2 hooks is the only legal gear. For personal use salmon fisheries, set gillnets are the only legal gear. For subsistence salmon fisheries, both set and drift gillnets within commercial districts, set gillnets outside commercial districts and in fresh waters, and spears in the Togiak River (excluding its tributaries) are the only legal gear.

METHODS

All existing escapement goals have been placed within 3 categories based on definitions within the department's *Salmon Escapement Goal Policy*: biological escapement, optimal escapement, and in-river goals (Appendix A).

All existing goals classified as biological escapement goals for the present report were set by ADF&G to ensure some level of sustainable production. Under the new policy, biological escapement goals are to be established at a level thought to produce maximum sustainable yield based on the biological characteristics of the spawning stock being managed. Unfortunately, I could not always determine whether existing goals represented the estimated number of spawning salmon needed to produce maximum sustained yield. All existing goals will be re-evaluated on a schedule which at least conforms to the triennial cycle of Alaska Board of Fisheries regulatory meetings. During these reviews, it may be necessary to modify existing escapement goals to better fit policy definitions.

Optimal escapement goals are now set through regulations adopted by the Alaska Board of Fisheries. These goals, based on allocative as well as biological factors, are objectives of regulatory management plans. An optimal escapement goal may differ from the biological escapement goal for a stock, but it must be set at a level capable of maintaining the stock at a sustainable level. Several stocks have existing goals which fit the definition of optimal escapement goals.

In-river goals are also now set through regulations adopted by the Alaska Board of Fisheries. An in-river goal for a stock is the sum of its optimal escapement goal and any specific allocations to fisheries occurring above the point where salmon escapement is estimated. Some existing regulatory management plans have goals that can be classified as in-river goals, although these plans do not always specify a corresponding optimal escapement goal. For example, the *Kenai River Sockeye Salmon Management Plan* (5 AAC 21.360; ADF&G 1993b) specifies an in-river goal of 400,000 to 700,000 sockeye salmon "to ensure an adequate spawning escapement and provide for a recreational harvest." The plan does not specify an optimal escapement goal.

For the purpose of this report, existing goals not currently adopted under regulations were defined as biological escapement goals, whereas goals set out in regulations (e.g., AAC 1991; AAC 1993; ADF&G 1992; ADF&G 1993a; ADF&G 1993b) were defined as either optimal escapement or in-river goals. One exception is the Nushagak River coho salmon in-river goal, which is not specified under a Board of Fisheries management plan but has been used by the department to provide for subsistence and recreational harvests taken above the counting site.

Several regulations also specify 1 or more escapement levels at which explicit management actions are to be taken, usually to help ensure that an optimal escapement goal is reached. Following *Salmon Escapement Goal Policy* definitions, these escapement levels are called action points. Although not listed as action points in this report, ADF&G routinely restricts the harvest of a salmon stock whenever total escapement is projected to be at a level below the biological escapement goal for that stock. Such restrictions may consist of reductions in fishing time and area for all fisheries, reductions in bag limits for recreational fisheries, and reductions in broodstock removals for state and private hatchery operations. A total closure may occur if restrictions inadequately ensure a biological escapement goal will be achieved. Unfortunately, the existence of regulatory management plans do not always make it easier to classify existing goals. For example, neither the *Copper River Personal Use Salmon Fishery Management Plan* (5 AAC 77.950) nor the *Copper River Subsistence Salmon Fisheries Management Plan*

(5 AAC 01.647) differentiates among salmon species when setting in-river goals or establishing action points.

Although all existing goals were placed into 1 of the 3 categories created under the *Salmon Escapement Goal Policy*, the task was sometimes difficult and subjective, because (1) all existing goals were set prior to adoption of the policy, and (2) the history and derivation of many existing goals were poorly documented. Reports containing information on escapement goal development do exist for Cook Inlet chum, pink, and sockeye salmon (Tarbox and Waltemyer 1986; Tarbox and Kyle 1989; Yuen 1992; Ruesch and Tarbox 1993) and Bristol Bay chinook, coho, and sockeye salmon (Fried 1984; Nelson 1987; Cross and Crawford 1991; Minard et al. 1991; Skrade et al. 1991). Information on escapement goals for other stocks listed in this report was obtained from memoranda and conversations with other ADF&G biologists. Remaining problems and uncertainties with existing goals will be resolved when they are re-evaluated under the provisions of the *Salmon Escapement Goal Policy*.

Biological escapement goals within this report have been set using a variety of procedures: (1) estimates of available spawning and rearing area, (2) average annual escapement obtained during a specific period, (3) average number of returning adults produced by each spawning salmon, and (4) estimates from recruitment curves developed by Ricker (e.g., 1954 and 1975). These biological escapement goals are described as either a single escapement level or a range of values. Use of a range, rather than a single value, is permitted under the *Salmon Escapement Goal Policy*, as long as the upper and lower limits of the range are consistent with maximum sustained yield estimates and are based on inherent variability in production. For some stocks, existing escapement goal ranges represent an acceptable low and high escapement interval about a point estimate of the biological escapement goal. For other stocks, the range is the biological escapement goal. Biological escapement goals for most Bristol Bay sockeye salmon stocks are point values, but management ranges have been placed around these goals with upper and lower limits representing escapement levels that would produce 95% of the estimated maximum sustained yield (Fried 1984). Biological escapement goals for some Cook Inlet pink and chum salmon stocks are ranges that have been set to allow escapement levels to be adjusted based on spawner distribution; the upper limits of these ranges are used only when large numbers of salmon move into upstream spawning areas (Yuen 1992). Biological escapement goals for all Prince William Sound chum salmon stocks, as well as some Cook Inlet and Bristol Bay sockeye salmon stocks (e.g., Kenai, Kasilof, and Kvichak Rivers), are ranges that encompass escapement levels thought to produce high, if not maximum, sustained yield (Tarbox and Waltemyer 1986; Cross and Crawford 1991; S. Sharr, ADF&G, Cordova, personal communication). For some pink salmon stocks, different biological escapement goals have been established for odd and even years. This has only been done for pink salmon stocks that exhibit cyclic dominance (i.e., all Prince William Sound stocks and the Bristol Bay Nushagak River stock), a phenomenon in which runs for one brood line are more abundant than runs from the other brood line.

Escapement enumeration techniques have varied over time and among systems. Some type of visual count made during aircraft overflights, foot surveys, tower observations, or weir operations is the most commonly available estimate of escapement. However, hydroacoustic (sonar) systems deployed at a fixed site are used in some large turbid or glacial systems for which visual estimates cannot be obtained (e.g., King and Tarbox 1991; Morstad 1993; Miller et al. 1994). Methods currently used to enumerate

escapement are documented for every stock listed in this report. Methods used in the past, but no longer employed, are also documented whenever the information was available.

Information on escapement goals for this report has been summarized by species, stock, and management area. Goals are provided for all 5 species of Pacific salmon (chinook *O. tshawytscha*, chum *O. keta*, coho *O. kisutch*, pink *O. gorbuscha*, and sockeye *O. nerka* salmon) occurring within the 3 management areas covered in this report (Prince William Sound, Cook Inlet, and Bristol Bay). Under Alaska Statute (SEC. 16.05.904; e.g., ADF&G 1992) a fish stock has been defined as "a species, subspecies, geographic grouping or other category of fish manageable as a unit." The definition of stock in the *Salmon Escapement Goal Policy* (Appendix A) is consistent with this definition, and stock groupings in this report may refer to a group of salmon spawning within (1) a single creek or stream, (2) a portion of a river drainage, (3) an entire river drainage, or (4) several creeks, streams, and rivers occurring in a single management unit.

The broadest classification of stocks in this report, in which several individual streams, creeks, and rivers were combined into a stock grouping, has been made for Prince William Sound chum and pink salmon. For the purpose of this report, the various index streams included in the aerial survey program were aggregated into district stock units. Chum salmon escapement goals have been set for 7 and pink salmon goals for 8 of the 11 commercial fishing districts. Neither chum nor pink salmon escapements are surveyed within the Copper River and Bering River Districts; escapement monitoring of the Unakwik District's small chum and pink salmon stocks (indexed by aerial surveys of Cowpen Creek) is not done annually, and only small numbers of chum salmon spawn within Eshamy District. Although Prince William Sound chum and pink salmon are generally managed as district units, ADF&G can redefine fishing areas within these districts to shift fishing effort away from individual drainages where escapement may be poor.

RESULTS

For the areas covered in this report, biological escapement goals have been established for 172 salmon stocks: 29 chinook, 21 chum, 12 coho, 40 even-year pink, 39 odd-year pink, and 31 sockeye salmon stocks. Optimal goals have been established for 4 chinook, 1 coho, and 4 sockeye salmon stocks; in-river goals have been set for 1 chinook, 1 coho, and 1 sockeye salmon stocks; and action points have been specified for 4 chinook, 1 coho, and 8 sockeye salmon stocks. Escapement enumeration methods for salmon stocks covered in this report are based on (1) aerial surveys for 89 stocks; (2) foot surveys for 40 stocks; (3) a combination of aerial and foot surveys for 15 stocks; (4) hydroacoustic assessments for 11 stocks; (5) weir counts for 9 stocks; (6) tower counts for 7 stocks; and (7) a combination of foot surveys and weir counts for 1 stock (Tables 1-5; Appendices B-O).

Chinook Salmon

Biological escapement goals have been established for 29 chinook salmon stocks within the 3 areas covered by this report (Table 1; Appendices B, C, and D). The sum of these biological escapement goals is 167,370 chinook salmon. Optimal goals have been established for 4 stocks, an in-river goal has been set for 1 stock, and action points have been established for 3 stocks. Escapement is estimated using aerial surveys for 20 stocks, foot surveys for 3 stocks, a combination of aerial and foot surveys for 3 stocks, and hydroacoustic assessments for 3 stocks.

Prince William Sound

A biological escapement goal has been established for 1 chinook salmon stock—Upper Copper River—in the Prince William Sound area (Table 1; Appendix B). This goal represents about 9% of all 6 chinook salmon biological escapement goals for the 3 management areas covered in this report. The Upper Copper River stock is managed primarily for commercial harvest by a drift gillnet fleet. Escapement is estimated using aerial surveys. An optimal escapement goal has also been established for this stock under 2 regulatory management plans: the *Copper River Personal Use Salmon Fishery Management Plan* (5 AAC 77.790) and the *Copper River Subsistence Fisheries Management Plan* (5 AAC 01.647; ADF&G 1993a).

Cook Inlet

Biological escapement goals have been established for 25 chinook salmon stocks within the Cook Inlet area (Table 1; Appendix C). The goals represent about 43% of all 29 chinook salmon biological escapement goals for the 3 management areas covered in this report. Cook Inlet chinook salmon stocks are managed primarily for recreational harvest, although a directed commercial fishery that is limited to a total harvest of 12,500 chinook salmon occurs each June for set gillnets in the Northern District under the *Northern District King Salmon Management Plan* (5 AAC 21.366; ADF&G 1993b). Escapements are estimated using aerial surveys for 17 stocks, foot surveys for 3 stocks, a combination of aerial and foot surveys for 3 stocks, and hydroacoustic assessments for 2 stocks. Optimal escapement goals and a total of 7 action points have been established for Kenai River early- and late-run stocks under 2 regulatory management plans: the *Kenai River Early King Salmon Management Plan* (5 AAC 56.070; AAC 1991) and the *Kenai River Late King Salmon Management Plan* (5 AAC 21.356; ADF&G 1993b).

Bristol Bay

Biological escapement goals have been established for 3 chinook salmon stocks within the Bristol Bay area (Table 1; Appendix D). These 3 goals represent about 48% of all 29 chinook salmon biological escapement goals for the 3 management areas covered in this report. Bristol Bay chinook salmon stocks are managed primarily for commercial use by a drift and set gillnet fleet, although important subsistence

and recreational fisheries occur in many drainages. Escapements are estimated using aerial surveys for 2 stocks and a hydroacoustic assessment for 1 stock. An optimal escapement goal, an in-river goal, and 4 action points have been established for the Nushagak River stock under the *Nushagak-Mulchatna Chinook Salmon Management Plan* (5 AAC 06.361; ADF&G 1992).

Chum Salmon

Biological escapement goals have been established for 21 chum salmon stocks within the 3 management areas covered in this report (Table 1; Appendices E, F, and G). The sum of the 21 biological escapement goals for these stocks ranges from 345,000 to 442,000 chum salmon, because biological escapement goals for all Prince William Sound stocks and some Cook Inlet stocks have been defined as ranges. Escapement is estimated using aerial surveys for 17 stocks, foot surveys for 3 stocks, and a combination of aerial and foot surveys for 1 stock.

Prince William Sound

Biological escapement goals for chum salmon have been established for 7 commercial fishing districts within the Prince William Sound area (Table 2; Appendix E). These 7 goals represent about 57%–58% of all 21 chum salmon biological escapement goals for the 3 management areas covered in this report. All 7 Prince William Sound chum salmon stocks are managed primarily for commercial harvest by a purse seine fleet. Escapements for all stocks are estimated using aerial surveys. No regulatory management plans specifying optimal escapement goals, in-river goals, or action points have been adopted for any of these stocks.

Cook Inlet

Biological escapement goals have been established for 14 chum salmon stocks within the Cook Inlet area (Table 2; Appendix F). These 14 goals represent about 42%–43% of all 21 chum salmon biological escapement goals for the 3 management areas covered in this report. These 14 Cook Inlet chum salmon stocks are managed primarily for commercial use by a purse seine fleet. Escapements are estimated using aerial surveys for 10 stocks, foot surveys for 3 stocks, and a combination of aerial and foot surveys for 1 stock. No regulatory management plans specifying optimal escapement goals, in-river goals, or action points have been adopted for any of these stocks.

Coho Salmon

Biological escapement goals have been established for 12 coho salmon stocks within the 3 management areas covered in this report (Table 3; Appendices G, H, and I). The sum of these biological escapement goals is 240,030 coho salmon. An optimal goal has been established for 1 stock, no in-river goals have

been established for any stocks, and an action point has been established for 1 stock. Escapement is estimated using aerial surveys for 4 stocks, foot surveys for 4 stocks, weir counts for 2 stocks, a combination of foot surveys and weir counts for 1 stock, and a hydroacoustic assessment for 1 stock.

Prince William Sound

Biological escapement goals have been established for 2 coho salmon stocks within the Prince William Sound management area (Table 3; Appendix G). These 2 goals represent about 30% of all 12 coho salmon biological escapement goals for the 3 management areas covered in this report. Both of these Prince William Sound coho salmon stocks are managed primarily for commercial harvest by a drift gillnet fleet, and escapements are estimated using aerial surveys. No regulatory management plans specifying optimal escapement goals, in-river goals, or action points have been adopted for any of these stocks.

Cook Inlet

Biological escapement goals have been established for 7 coho salmon stocks within the Cook Inlet area (Table 3; Appendix H). These 7 goals represent about 5% of all 12 coho salmon biological escapement goals for the 3 management areas covered in this report. Cook Inlet coho salmon stocks are managed primarily for recreational harvest. Escapements are estimated using foot surveys for 4 stocks, weir counts for 2 stocks, and a combination of foot surveys and weir counts for 1 stock. An optimal escapement goal and an action point have been established for Little Susitna River coho salmon under the *Little Susitna River Coho Salmon Management Plan* (5 AAC 56.060; AAC 1993).

Bristol Bay

Biological escapement goals have been established for 3 coho salmon stocks within the Bristol Bay area (Table 3; Appendix I). These 3 goals represent about 65% of all 12 coho salmon biological escapement goals for the 3 management areas covered in this report. Bristol Bay coho salmon stocks are managed primarily for commercial use by a drift and set gillnet fleet. Escapements are estimated using aerial surveys for 2 stocks and a hydroacoustic assessment for 1 stock. No regulatory management plans specifying optimal escapement goals, in-river goals, or action points have been adopted for any of these stocks.

Pink Salmon

Biological escapement goals have been established for 40 even-year and 39 odd-year pink salmon stocks within the 3 management areas covered in this report (Table 4; Appendices J, K, and L). For Prince William Sound and Bristol Bay stocks, different goals were set for odd- and even-year runs. For Cook Inlet stocks, the same goals have been used for odd- and even-year runs. The sum of the 79 biological

escapement goals established for these stocks range from 1,810,000 to 2,047,100 pink salmon for odd years and from 2,708,500 to 2,945,600 for even years because biological escapement goals for some Cook Inlet stocks have been defined as a range. No optimal escapement goals, in-river goals, or action points have been established for any of these stocks. Escapement is estimated using aerial surveys for 38 stocks, foot surveys for 30 stocks, a combination of aerial and foot surveys for 10 stocks, and a hydroacoustic assessment for 1 stock.

Prince William Sound

Biological escapement goals for pink salmon have been established for 16 pink salmon stocks within the Prince William Sound area (Table 4; Appendix J). The 8 odd-year goals represent about 70%–79% of all 40 odd-year pink salmon biological escapement goals for the 3 management areas covered in this report. The 8 even-year goals represent about 48%–53% of all 39 even-year goals. Prince William Sound pink salmon stocks are managed primarily for commercial harvest by a purse seine fleet. Escapements for all stocks in this area are estimated using aerial surveys. No regulatory management plans specifying optimal escapement goals, in-river goals, or action points have been adopted for any of these stocks.

Cook Inlet

Biological escapement goals have been established for 62 pink salmon stocks within the Cook Inlet area during odd and even years (Table 4; Appendix K). The 31 odd-year goals represent about 21%–30% of all 40 odd-year pink salmon biological escapement goals for the 3 management areas covered in this report. The 31 even-year goals represent about 14%–21% of all 40 even-year goals. Cook Inlet pink salmon stocks are managed primarily for commercial use by a purse seine fleet, and escapements are estimated using aerial surveys for 22 stocks, foot surveys for 30 stocks, and a combination of aerial and foot surveys for 10 stocks. No regulatory management plans specifying optimal escapement goals, in-river goals, or action points have been adopted for any of these stocks.

Bristol Bay

A biological escapement goal has been established for only 1 stock—Nushagak River pink salmon—within the Bristol Bay area (Table 4; Appendix L). This goal represents about 31%–33% of all 40 even-year pink salmon biological escapement goals for the 3 management areas covered in this report. No biological escapement goal has been set for this stock during odd years when runs to this system are usually extremely small. The Nushagak River stock is managed primarily for commercial use by a drift and set gillnet fleet, and escapement is estimated using hydroacoustic assessment. No regulatory management plans specifying optimal escapement goals, in-river goals, or action points have been adopted for this stock.

Sockeye Salmon

Biological escapement goals have been established for 31 sockeye salmon stocks within the 3 management areas covered in this report (Table 5; Appendices M, N, and O). The sum of the biological escapement goals for these stocks ranges from 10,129,000 to 14,574,000 sockeye salmon. Optimal goals have been established for 5 stocks, in-river goals have been established for 1 stock, and action points have been established for 7 stocks. Escapement is estimated using aerial surveys for 10 stocks, tower counts for 7 stocks, weir counts for 7 stocks, hydroacoustic assessments for 6 stocks, and a combination of aerial and foot surveys for 1 stock.

Prince William Sound

Biological escapement goals have been established for 5 sockeye salmon stocks within the Prince William Sound area (Table 5; Appendix M). These 5 goals represent about 3%–5% of all 31 sockeye salmon biological escapement goals for the 3 management areas covered in this report. Prince William Sound sockeye salmon stocks are managed primarily for commercial harvest by a drift gillnet fleet. Escapements are estimated using aerial surveys for 2 stocks, weir counts for 2 stocks, and a hydroacoustic assessment for 1 stock. An optimal escapement goal has been established for the Upper Copper River stock under 2 regulatory management plans: the *Copper River Personal Use Salmon Fishery Management Plan* (5 AAC 77.790) and the *Copper River Subsistence Fisheries Management Plan* (5 AAC 01.647; ADF&G 1993a).

Cook Inlet

Biological escapement goals have been established for 17 sockeye salmon stocks within the Cook Inlet area (Table 5; Appendix N). These 17 goals represent about 9% of all 31 sockeye salmon biological escapement goals for the 3 management areas covered in this report. Fifteen of the Cook Inlet sockeye salmon stocks are managed primarily for commercial harvest by a drift and set gillnet fleet. The remaining 2 stocks, Russian River early run and late runs, are managed primarily for recreational harvest. Escapements are estimated using aerial surveys for 7 stocks, hydroacoustic assessments for 4 stocks, weir counts for 5 stocks, and a combination of aerial and foot surveys for 1 stock. Optimal escapement goals have been established for 4 stocks, an in-river goal has been set for 1 stock, and a total of 9 action points have been adopted for 6 stocks under 5 regulatory management plans: the *Kenai River Sockeye Salmon Management Plan* (5 AAC 21.360; ADF&G 1993b), the *Russian River Sockeye Salmon Management Plan* (5 AAC.21.361; ADF&G 1993b), the *Fish Creek Sockeye Salmon Management Plan* (5 AAC 21.364; ADF&G 1993b), the *Kasilof River Sockeye Salmon Special Harvest Area Management Plan* (5 AAC 21.365; ADF&G 1993b), and the *Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan* (5 AAC 77.545; ADF&G 1993a). Two action points for a 7th stock have been established under the *Mikfik Creek-McNeil Lagoon Management Plan*, which was approved under authority of the ADF&G commissioner but which has not been adopted into regulation by the Alaska Board of Fisheries.

Bristol Bay

Biological escapement goals have been established for 9 sockeye salmon stocks within the Bristol Bay area (Table 5; Appendix O). These 9 goals represent about 86%–88% of all 31 sockeye salmon biological escapement goals for the 3 management areas covered in this report. Bristol Bay sockeye salmon stocks are managed primarily for commercial use by a drift and set gillnet fleet. Escapements are estimated using tower counts for 7 stocks, aerial surveys for 1 stock, and a hydroacoustic assessment for 1 stock. No regulatory management plans specifying optimal escapement goals, in-river goals, or action points have been adopted for any of these stocks.

DISCUSSION

The primary intent of this report is to compile existing escapement goals for the Prince William Sound, Cook Inlet, and Bristol Bay management areas. To my knowledge, this manuscript represents the first time these goals have been summarized within a single report. The setting and attainment of escapement goals are the basis of salmon management in the State of Alaska. However, prior to the adoption of the *Salmon Escapement Goal Policy* by ADF&G, no formal process of reviewing, setting, and revising escapement goals existed. The policy will ensure that escapement goals are not set arbitrarily and that public input in setting and modifying these goals will be routinely obtained through the Alaska Board of Fisheries process. The policy will also ensure the methods and reasonings used to develop each goal will be more thoroughly documented than has, unfortunately, often been the case in past years.

Biological escapement goals represent an estimate, based on the best available information, of the number of spawning salmon that, on average, will produce the greatest number of returning adults which are surplus to spawning needs and available for harvest. The accuracy with which fishery scientists are able to identify these goals is largely based on the quality and quantity of information available for analyses. Setting realistic goals generally requires a series of data on escapements and subsequent adult returns over a wide range of escapement levels over a large number of years. A long time series of data is needed because production from similar escapement levels can vary greatly due to a wide range of factors, including changing environmental conditions and spawner distribution. Estimates of available spawning habitat and rearing capacity for juveniles can be used to set escapement goals in conjunction with, or in the absence of, spawner-return data.

All biological escapement goals listed in this report were set to ensure a high average level of annual sustained yield and have been based on some type of repeatable, quantitative estimate of spawner abundance. Our ability to more accurately identify biological escapement goals will improve as new techniques allow us to increase the accuracy of escapement estimates, improve our ability to identify individual stocks in mixed stock catches, and provide us with a greater understanding of the many factors affecting salmon production. The continued health of these salmon resources also heavily depends upon our success in protecting spawning and rearing habitat from incompatible uses.

LITERATURE CITED

AAC (Alaska Administrative Code). 1991. Title 5, fish and game, register 119, October 1991. State of Alaska, Juneau.

AAC (Alaska Administrative Code). 1993. Title 5, fish and game, April 1993 cumulative supplement including registers 120 through 125. State of Alaska, Juneau.

ADF&G (Alaska Department of Fish and Game). 1992. 1992-94 Bristol Bay and Westward Alaska commercial fishing regulations. Salmon and miscellaneous finfish. Alaska Department of Fish and Game, Juneau.

ADF&G (Alaska Department of Fish and Game). 1993a. 1993 subsistence and personal use fishing regulations. Alaska Department of Fish and Game, Juneau.

ADF&G (Alaska Department of Fish and Game). 1993b. 1993 Cook Inlet/Kodiak/Chignik commercial fishing regulations. Alaska Department of Fish and Game, Juneau.

Bucher, W., L. Hammarstrom, H. Yuen, and J. Brady. 1993. McNeil River chum salmon fishery management plan. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A93-27, Anchorage.

Coggins, L. G., and A. E. Bingham. 1993. Stock assessment of the chinook salmon return to the Naknek River, Alaska, during 1992. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series 93-26, Anchorage.

Cross, B. A., and D. A. Crawford. 1991. Spawning escapement goal evaluation for Kvichak River sockeye salmon. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A91-16, Anchorage.

Delaney, K., and D. Vincent-Lang. 1992. Current status and recommendations for the future management of the chinook salmon stocks of northern Cook Inlet. Alaska Department of Fish and Game, Division of Sport Fish, Anchorage.

Fried, S. M. 1984. Bristol Bay Pacific salmon spawning escapement goal workshop. Alaska Department of Fish and Game, Division of Commercial Fisheries, Inter-Departmental Report, Bristol Bay Data Report 84-12, Anchorage.

King, B. E., and K. E. Tarbox. 1991. Upper Cook Inlet salmon escapement studies, 1990. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 91-21, Juneau.

LITERATURE CITED (Continued)

Miller, J. D., L. K. Brannian, and B. A. Cross. 1994. Sonar enumeration of Pacific salmon into the Nushagak River and evaluation of species composition estimates, 1992. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Technical Fisheries Report 94-06, Juneau.

Minard, M., J. Skrade, T. Brookover, D. Dunaway, B. Cross, and J. Schichnes. 1991. Escapement requirements and fishery descriptions for Nushagak drainage chinook salmon. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A91-09, Anchorage.

Morstad, S. 1993. Copper River hydroacoustic salmon enumeration studies, 1992. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report 2A93-07, Anchorage.

Nelson, M. 1987. History and management of the Nushagak chinook salmon fishery. Alaska Department of Fish and Game, Division of Commercial Fisheries, Bristol Bay Data Report 87-01, Anchorage.

Pirtle, R. B. 1978. Annual management report. 1977. Prince William Sound area. Region II. Alaska Department of Fish and Game, Division of Commercial Fisheries, Cordova.

Ricker, W. E. 1954. Stock and recruitment. Journal of the Fisheries Research Board of Canada 11:559-623.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada Bulletin 191, Ottawa.

Ruesch, P. H., and K. E. Tarbox. 1993. A brief summary of the status of Susitna River sockeye salmon. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Informational Report 2A93-23, Anchorage.

Skrade, J., T. E. Brookover, B. Cross, R. E. Minard, and J. Schichnes. 1991. Review of the Nushagak watershed coho salmon fisheries and stock status. Report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2A91-10, Anchorage.

Tarbox, K. E., and G. B. Kyle. 1989. An estimate of adult sockeye salmon (*Oncorhynchus nerka*) production, based on euphotic volume, for the Susitna River drainage, Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 2S89-01, Anchorage.

LITERATURE CITED (Continued)

Tarbox, K. E., and D. C. Waltemyer. 1986. History and evaluation of sockeye salmon escapement goals for the Kenai, Kasilof, and Susitna Rivers, Upper Cook Inlet, Alaska. Alaska Department of Fish and Game, Division of Commercial Fisheries, Upper Cook Inlet Data Report 86-04, Soldotna.

Yuen, H. J. 1992. History of Lower Cook Inlet pink, sockeye, and chum salmon escapement goals. Alaska Department of Fish and Game, Division of Commercial Fisheries, Technical Fishery Report 92-01, Juneau.

Table 1. Escapement goals for chinook salmon in the Prince William Sound, Cook Inlet, and Bristol Bay management areas, 1994.

Stock	Escapement Goal			Escapement Enumeration Method
	Biological	Optimal	In-River	
		Prince William Sound		
Upper Copper River	15,000	15,000		Aerial Survey
		Cook Inlet		
Alexander Creek	2,700			Aerial Survey
Anchor River	1,790			Aerial/Foot Survey
Campbell Creek	250			Foot Survey
Chuitna River	1,400			Aerial Survey
Chulitna River	2,000			Aerial Survey
Clear Creek	1,300			Aerial Survey
Deep Creek	950			Aerial/Foot Survey
Deshka River	11,200			Aerial Survey
Eagle River - South Fork	300			Foot Survey
Goose Creek	350			Aerial Survey
Kenai River				
Early Run	9,000	9,000		Hydroacoustics
Late Run	22,300	22,300		Hydroacoustics
Lake Creek	2,900			Aerial Survey
Lewis River	400			Aerial Survey
Little Susitna River	850			Aerial Survey
Little Willow Creek	650			Aerial Survey
Montana Creek	1,100			Aerial Survey
Ninilchik River	830			Aerial/Foot Survey
Peters Creek	1,300			Aerial Survey
Prairie Creek	4,700			Aerial Survey
Sheep Creek	650			Aerial Survey
Ship Creek	250			Foot Survey
Talachulitna River	2,700			Aerial Survey
Theodore River	750			Aerial Survey
Willow Creek	1,750			Aerial Survey
		Bristol Bay		
Naknek River	5,000			Aerial Survey
Nushagak River	65,000	65,000	75,000	Hydroacoustics
Togiak River	10,000			Aerial Survey

Table 2. Escapement goals for chum salmon in the Prince William Sound and Cook Inlet management areas, 1994.

Stock	Escapement Goal			Escapement Enumeration Method
	Biological	Optimal	In-River	
Prince William Sound				
Coghill District	29,600 to 37,050			Aerial Survey
Eastern District	87,200 to 109,000			Aerial Survey
Montague District	11,400 to 14,250			Aerial Survey
Northern District	29,400 to 36,750			Aerial Survey
Northwestern District	19,000 to 23,700			Aerial Survey
Southeastern District	20,000 to 25,000			Aerial Survey
Southwestern District	3,400 to 4,250			Aerial Survey
Cook Inlet				
Big Kamishak River	20,000			Aerial Survey
Bruin River	5,000 to 10,000			Aerial Survey
Clearwater Creek	10,000			Aerial Survey
Cottonwood Creek (Kamishak)	10,000			Aerial Survey
Dogfish Lagoon	5,000 to 10,000			Aerial/Foot Survey
Iniskin River	10,000			Aerial Survey
Little Kamishak River	20,000			Aerial Survey
Island Creek	10,000 to 15,000			Foot Survey
McNeil River	20,000 to 40,000			Aerial Survey
Petrof River	2,000 to 5,000			Aerial Survey
Port Dick	4,000			Foot Survey
Port Graham River	4,000 to 8,000			Foot Survey
Rocky River	20,000			Aerial Survey
Ursus Cove	5,000 to 10,000			Aerial Survey

Table 3. Escapement goals for coho salmon in the Prince William Sound, Cook Inlet, and Bristol Bay management areas, 1994.

Stock	Escapement Goal			Escapement Enumeration Method
	Biological	Optimal	In-River	
		Prince William Sound		
Bering River Delta	23,000			Aerial Survey
Copper River Delta	50,000			Aerial Survey
		Cook Inlet		
Campbell Creek	200			Foot Survey/Weir
Cottonwood Creek (Knik Arm)	300			Foot Survey
Fish Creek (Knik Arm)	2,700			Weir
Jim Creek	830			Foot Survey
Little Susitna River	7,500	7,500		Weir
Ship Creek	200			Foot Survey
Wasilla Creek	300			Foot Survey
		Bristol Bay		
Kulukak River	15,000			Aerial Survey
Nushagak River	90,000			Hydroacoustics
Togiak River	50,000			Aerial Survey

Table 4. Escapement goals for pink salmon in the Prince William Sound, Cook Inlet, and Bristol Bay management areas, 1994.

Stock	Escapement Goal			Escapement Enumeration Method
	Biological	Optimal	In-River	
Prince William Sound				
Coghill District				
Odd Years	178,000			Aerial Survey
Even Years	143,000			Aerial Survey
Eastern District				
Odd Years	422,000			Aerial Survey
Even Years	474,000			Aerial Survey
Eshamy District				
Odd Years	5,700			Aerial Survey
Even Years	8,200			Aerial Survey
Montague District				
Odd Years	162,000			Aerial Survey
Even Years	70,000			Aerial Survey
Northern District				
Odd Years	128,000			Aerial Survey
Even Years	213,000			Aerial Survey
Northwestern District				
Odd Years	83,000			Aerial Survey
Even Years	135,000			Aerial Survey
Southeastern District				
Odd Years	333,000			Aerial Survey
Even Years	239,000			Aerial Survey
Southwestern District				
Odd Years	116,000			Aerial Survey
Even Years	144,000			Aerial Survey
Cook Inlet				
Aialik Lake Creek	5,000			Aerial Survey
Airport Creek	300 to 400			Aerial/Foot Survey
Amakdedori Creek	5,000			Aerial Survey
Barabara Creek	18,000 to 24,000			Foot Survey
Bear Creek	5,000			Aerial/Foot Survey
Big Kamishak River	20,000			Aerial Survey
Brown's Peak Creek	10,000 to 20,000			Aerial Survey
Bruin River	25,000 to 50,000			Aerial Survey
China Poot Creek	5,000			Foot Survey

-Continued-

Table 4. (Page 2 of 2)

Stock	Escapement Goal			Escapement Enumeration Method
	Biological	Optimal	In-River	
	Cook Inlet (continued)			
Clear Creek	2,000			Foot Survey
Desire Lake Creek	10,000 to 20,000			Aerial Survey
Grouse Creek	1,000 to 2,000			Aerial/Foot Survey
Humpy Cove (Eastern Dist)	2,000			Aerial Survey
Humpy Creek (Southern Dist)	25,000 to 50,000			Foot Survey
Island Creek	12,000 to 18,000			Foot Survey
James Lagoon	5,000 to 10,000			Foot Survey
Little Kamishak River	20,000			Aerial Survey
Mayor Creek	2,000			Foot Survey
Port Chatham	10,000 to 15,000			Foot Survey
Port Dick Creek	20,000 to 100,000			Foot Survey
Port Graham River	20,000 to 40,000			Foot Survey
Rocky River	50,000			Aerial Survey
Salmon Creek	10,000			Foot Survey
Seldovia Creek	25,000 to 35,000			Foot Survey
South Nuka Island Creek	10,000			Aerial/Foot Survey
Sunday Creek	10,000 to 20,000			Aerial Survey
Thumb Cove	4,000			Aerial Survey
Tonsina Creek	5,000			Aerial/Foot Survey
Tutka Creek	6,000 to 10,000			Foot Survey
Windy Creek Left	30,000 to 50,000			Foot Survey
Windy Creek Right	10,000			Foot Survey
	Bristol Bay			
Nushagak River				
Even Years	900,000			Hydroacoustics

Table 5. Escapement goals for sockeye salmon in the Prince William Sound, Cook Inlet, and Bristol Bay management areas, 1994.

Stock	Escapement Goal			Escapement Enumeration Method
	Biological	Optimal	In-River	
Prince William Sound				
Bering River Delta	32,000			Aerial Survey
Coghill Lake	25,000			Weir
Copper River Delta	90,000			Aerial Survey
Eshamy Lake	35,000			Weir
Upper Copper River	300,000	300,000		Hydroacoustics
Cook Inlet				
Aialik Lake	2,000 to 5,000			Aerial Survey
Amakdedori Creek	1,000			Aerial Survey
Anderson Beach	2,000			Aerial/Foot Survey
Bear Lake	1,000			Weir
Chenik Lake	10,000			Aerial Survey
Crescent River	50,000 to 100,000			Hydroacoustics
Delight Lake	10,000			Aerial Survey
Desire Lake	10,000			Aerial Survey
English Bay River	10,000 to 20,000			Aerial Survey
Fish Creek (Knik Arm)	50,000	50,000		Weir
Kasilof River	150,000 to 250,000			Hydroacoustics
Kenai River	300,000 to 570,000	300,000 to 570,000	400,000 to 700,000	Hydroacoustics
Mikfik Creek	5,000 to 7,000			Aerial Survey
Packers Creek	15,000 to 25,000			Weir
Russian River				
Early Run	16,000	16,000		Weir
Late Run	30,000	30,000		Weir
Susitna River	200,000			Hydroacoustics
Bristol Bay				
Branch (Alagnak) River	185,000			Aerial Survey
Egegik River	1,000,000			Tower
Igushik River	200,000			Tower
Kvichak River	4,000,000 to 8,000,000			Tower
Naknek River	1,000,000			Tower
Nushagak River	550,000			Hydroacoustics
Togiak River	150,000			Tower
Ugashik River	700,000			Tower
Wood River	1,000,000			Tower

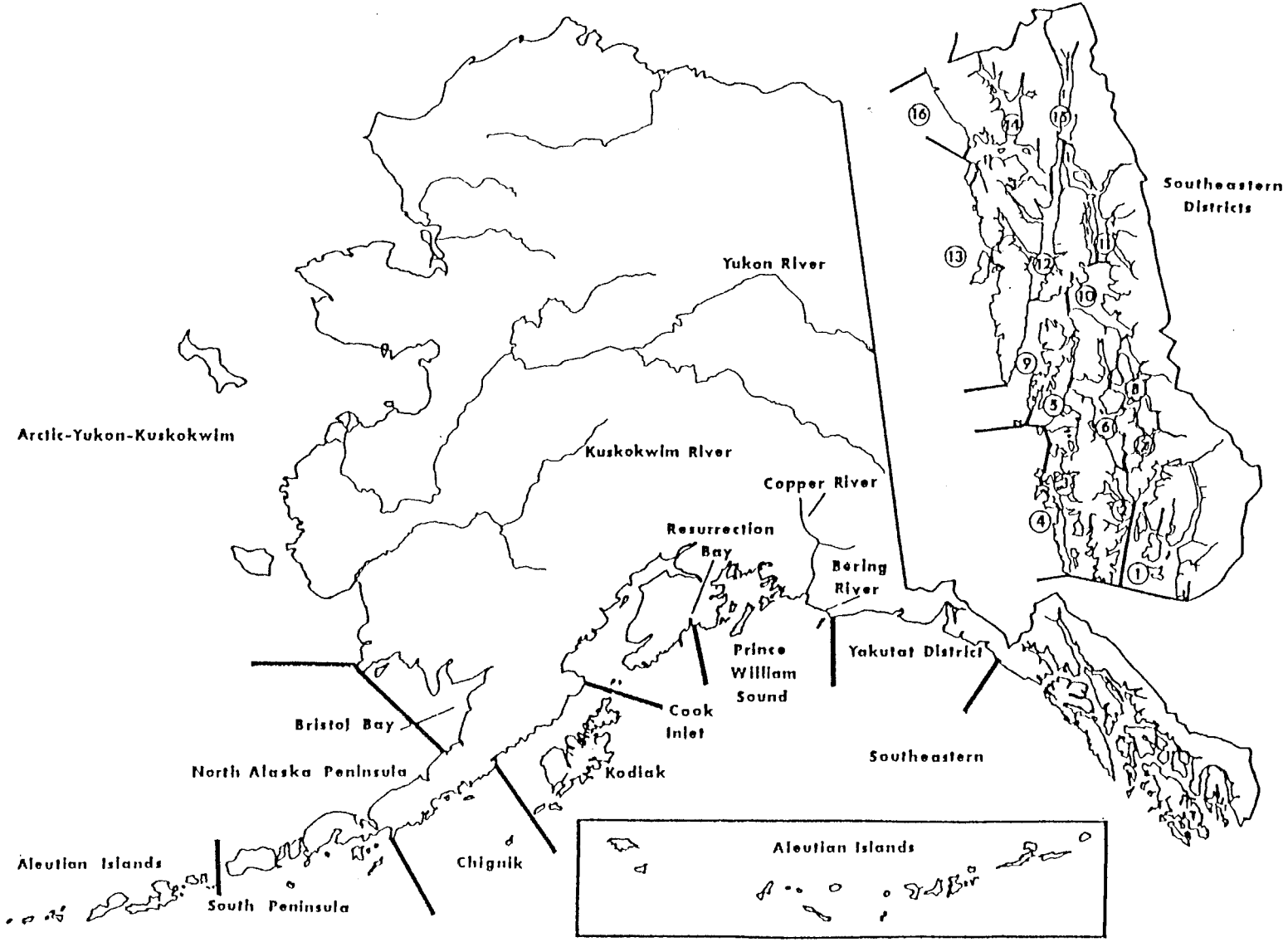

Figure 1. Alaska salmon management areas.

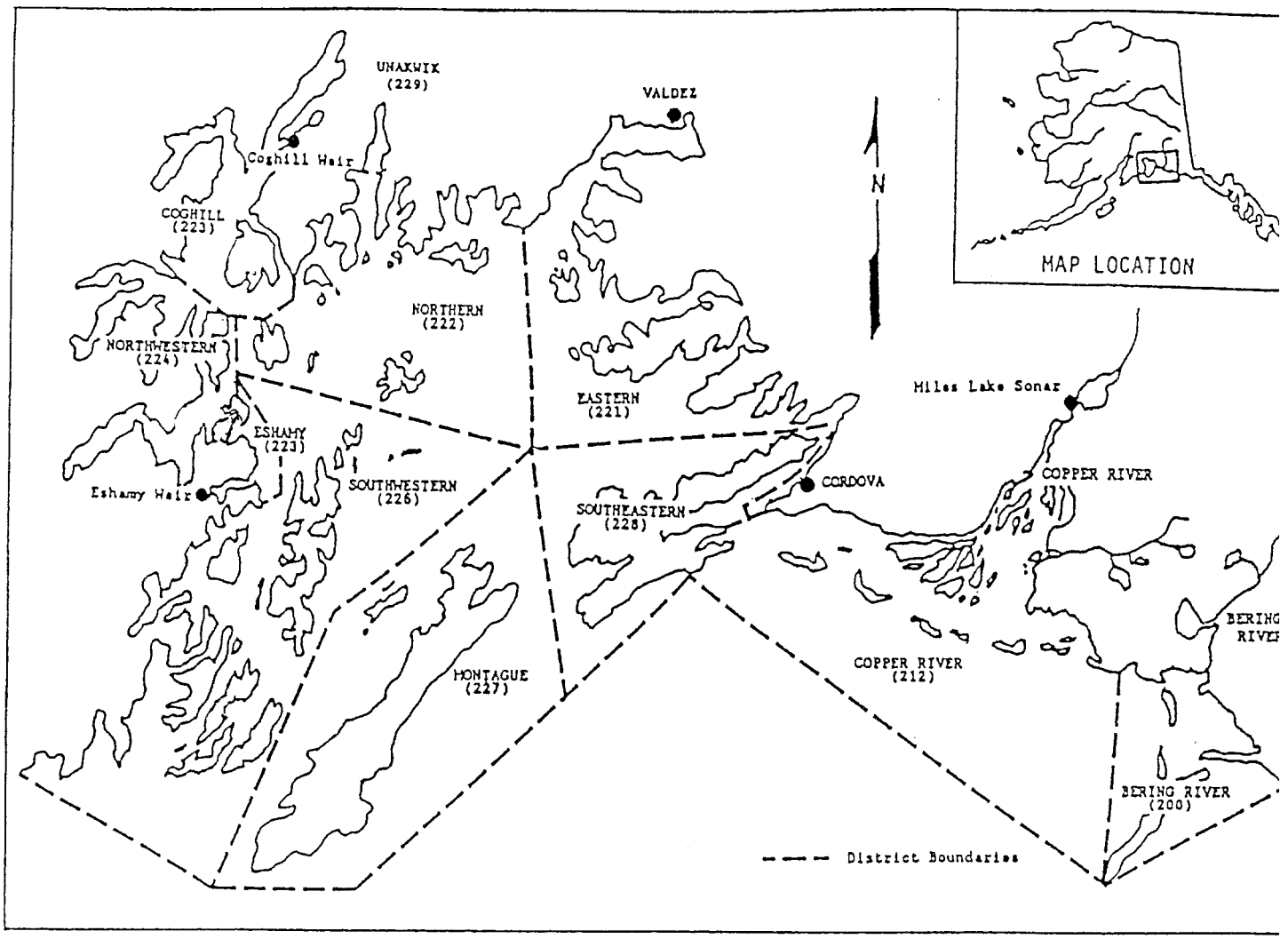

Figure 2. Prince William Sound management area showing commercial fishing districts, weir locations, and hydroacoustic (sonar) site.

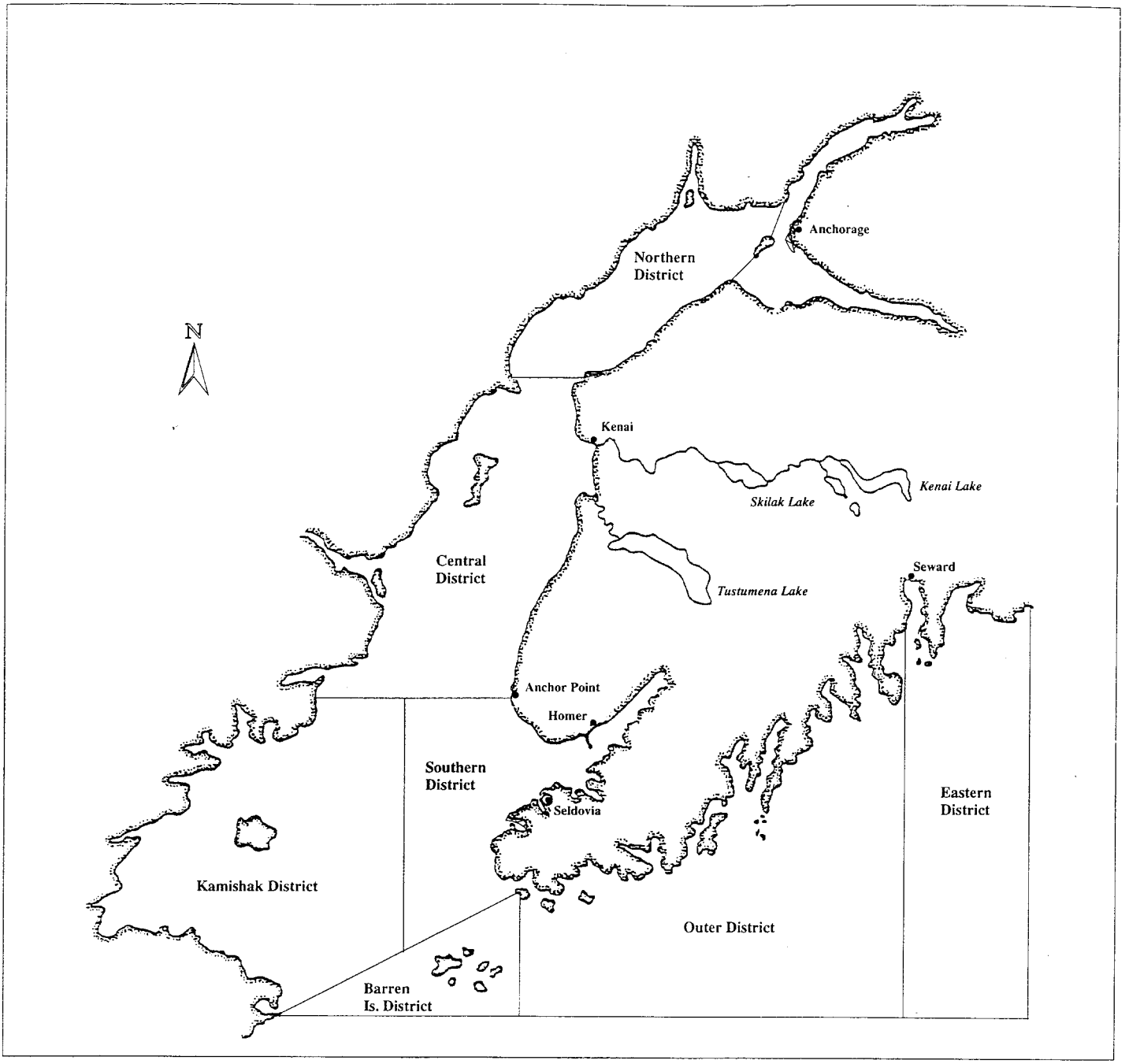

Figure 3. Cook Inlet management area showing commercial fishing districts.

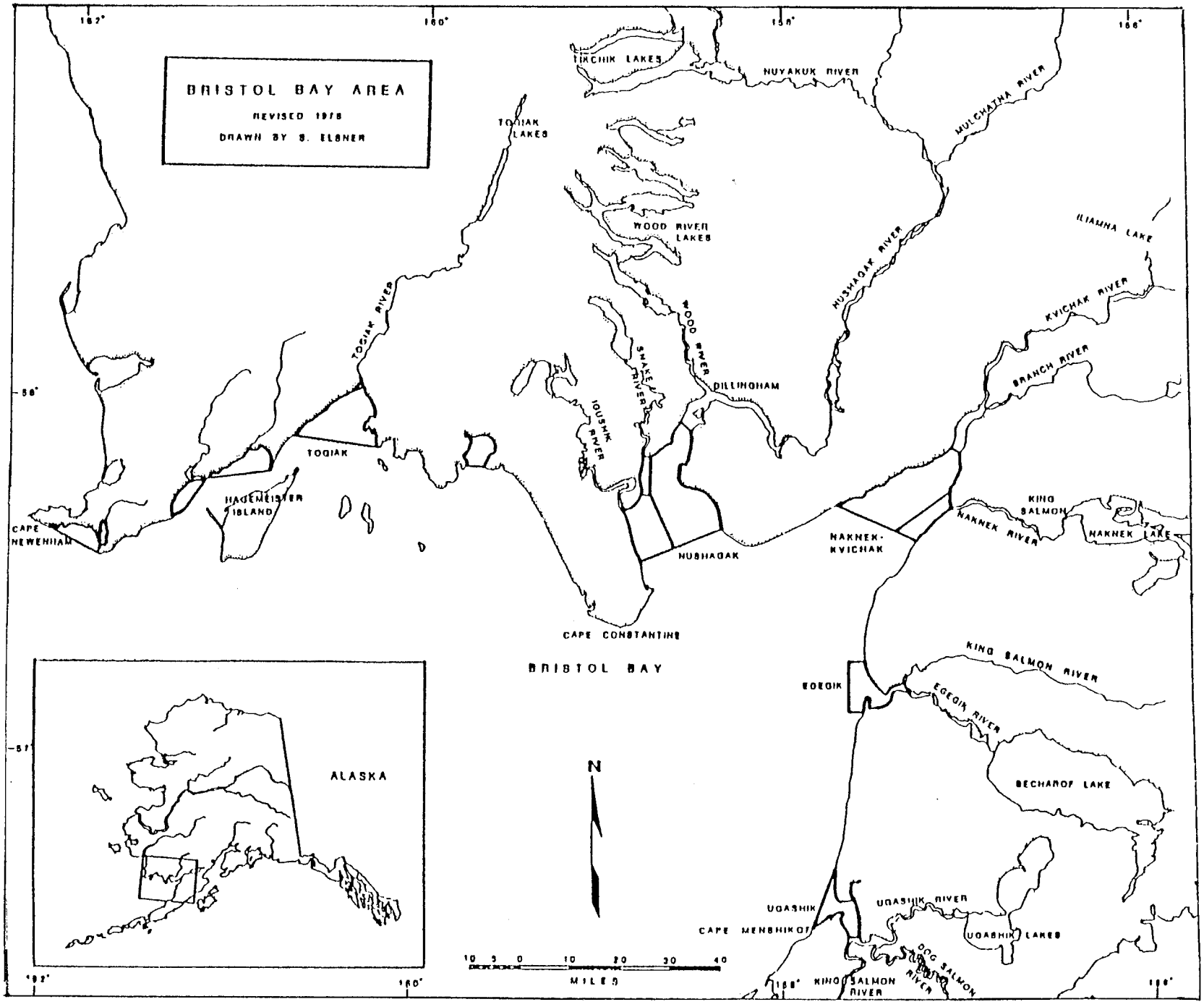

Figure 4. Bristol Bay management area showing commercial fishing districts and major salmon spawning systems.

APPENDIX

APPENDIX A. Salmon Escapement Goal Policy Adopted by the Alaska Department of Fish and Game in 1992

SALMON ESCAPEMENT GOAL POLICY

Alaska Department of Fish and Game

Introduction:

The Alaska Constitution mandates the Department of Fish and Game to manage fishery resources on a sustained yield basis. For salmon fisheries with stable fishing effort, sustained yield can be achieved by conservative management practices such as limited catch quotas and limited scheduled fishing periods. However, for fisheries with expanding levels of fishing effort or excessive fishing power, sustained yield management requires that the department assess the number of salmon that spawn on an annual basis. The department has the authority to establish the annual level of salmon spawning stock required to maintain a sustainable harvest and also to manage commercial, sport, personal use, and subsistence fisheries to ensure that annual spawning escapement requirements are met.

The mission of the department needs to be clearly defined with respect to the mandated sustained yield principle. A wide range of sustainable yields are possible for salmon fisheries. The department has improved the methods and procedures for enumerating salmon spawning stock levels. The department has also developed methods for estimating the salmon carrying capacity of freshwater rearing environment for selected stocks. This information has enabled the department to obtain a better scientific understanding of the relationship between salmon spawning stock level and resulting level of return. Consequently, scientifically based spawning stock levels that produce the maximum number of harvestable fish can be estimated for many salmon fisheries.

There are many fisheries where the department lacks the necessary management program and scientific information to manage for maximum sustained yield. For these situations where fishing effort is expanding or fishing power is excessive, the department must necessarily implement more conservative fisheries management measures to assure sustainable yield. For fisheries that are supported by numerous, small, and unsurveyed streams, management will remain more a matter of scientific judgement. In all cases, conservative fishery management practices will result in yields that are lower than the stock's potential.

Unless otherwise directed by regulation, the department will manage Alaska's salmon fisheries, to the extent possible, for maximum sustained yield. To this end, the department will aggressively pursue the further development of escapement enumeration programs, in-season fishery management programs, and scientific methods to determine escapement levels which produce maximum sustained yield.

Purpose of the Escapement Goal Policy:

This policy applies to wild anadromous Pacific salmon. The purposes for this policy are to:

1. Establish definitions and concepts relating to escapement goals.

2. Specify criteria and procedures for establishing and modifying escapement goals.

3. Set up a process that facilitates public review of allocative issues associated with establishing and modifying escapement goals.

Definitions:

Salmon: is any of the five wild anadromous Pacific salmon species native to Alaska: chinook, coho, sockeye, chum and pink salmon.

Stock: is a locally interbreeding group of salmon that is distinguished by a distinct combination of genetic, phenotype, life history, and habitat characteristics. Recognizing that most fisheries harvest mixed stocks and when this constrains management, stocks may be aggregated into larger groups for purposes of this policy. This definition is consistent with "stock" as defined in statute (AS 16.05.940(15)).

Escapement: is the annual estimated size of the spawning stock. Quality as characterized by sex and age composition may be considered in estimating escapement.

Yield: is the number of fish harvested in a particular year or season from a stock.

Sustainable Yield: is the average annual yield that results from a level of escapement that can be maintained on a continuing basis. A wide range of average annual yield levels are sustainable.

Maximum Sustainable Yield (MSY): is the greatest average annual yield from a stock. In practice, MSY is approached when a constant level of escapement is maintained on an annual basis regardless of run strength. The achievement of MSY requires a high degree of management precision and scientific information regarding the relationship between escapement and subsequent return.

Biological Escapement Goal (BEG): is the estimated escapement that produces the greatest yield, is the specific management objective for the escapement, is developed from the best available biological information, and is scientifically defensible on the basis of available biological information. The BEG is determined by the Department of Fish and Game.

Optimal Escapement Goal (OEG): is a specific management objective for the escapement that considers biological and allocative factors. The optimal escapement goal is determined by the Alaska Board of Fisheries. The optimal escapement goal may or may not be equal to the BEG but is always sustainable.

Action Point: is a threshold value for some quantitative indicator of stock run strength at which some explicit management action will be taken to reach the optimal escapement goal. An action point may be derived from criteria about locations or dates and may include a statistical projection of abundance, escapement, or harvest.

In-River Run Goal: is defined by the Board of Fisheries for stocks that are subject

to in-river harvest above the point where escapement can be estimated. The in-river run goal is comprised of the optimal escapement goal plus specific allocations to in-river fisheries and may include allocations to provide higher catch per unit effort for in-river sport fisheries.

Procedures for Documenting, Establishing and Modifying, and Reviewing Escapement Goals:

Documentation of Existing Escapement Goals:

The department will document existing escapement goals for Alaska salmon fisheries in a single report. The development of the report will be coordinated by the Chief Fisheries Scientist, Division of Commercial Fisheries. Escapement goals will be summarized by fishery, species and stock for the following commercial finfish regulatory areas or groups of areas: 1) Southeast Alaska and Yakutat areas, 2) Prince William Sound area, 3) Cook Inlet area, 4) Kodiak area, 5) Chignik area, 6) Alaska Peninsula and Aleutian Islands areas, 7) Bristol Bay area, and 8) Kuskokwim, Yukon, Norton Sound-Port Clarence, and Kotzebue-Northern areas.

The report will encompass all stocks which are currently managed for an escapement goal or other repeatable, quantitative estimate of spawner abundance. The department will classify each goal so that it is consistent with this policy, provide a brief explanation of the genesis of the current goal, identify the method for estimating or indexing escapement, and identify the fishery division having primary management responsibility. It is the department's intent to revise the report as escapement goals are established or modified.

Establishing and Modifying Escapement Goals:

The department will follow these guidelines for establishing and modifying escapement goals:

1. Biological escapement goals should be established for stocks for which the department can estimate or index salmon escapement levels. Biological escapement goals will be changed whenever new information suggests that future sustained harvest levels can be increased by that change.

2. Biological escapement goals may be a single escapement level or a range of escapement levels. Whenever the biological escapement goal is specified as a range; the lower and upper limits of escapement will be consistent with MSY and based on the inherent variability in production of the stock.

3. Whenever the department wishes to establish a new biological escapement goal or modify an existing biological escapement goal, a scientific analysis with supporting data must be prepared.

4. The department will determine whether there is substantive allocation impacts arising from management actions needed to achieve any proposed biological escapement goal. When such a determination is made, it will be presented to the Board of Fisheries.

Review Process for Escapement Goals:

An analysis supporting the proposed biological escapement goal or biological escapement goal change will be developed by the region of the division with primary management responsibility for the affected stock. The region developing the proposal will provide opportunities for appropriate personnel from other divisions to participate in developing the analysis of the proposed BEG.

Following development of the analysis supporting the proposed BEG, an inter-divisional review team will be appointed by the appropriate regional supervisors of the Divisions of Commercial Fisheries and Sport Fish. The regional supervisors will request technical assistance from their respective division's headquarters, FRED Division, and also non-departmental experts as appropriate. The review team will assess the scientific merits of the BEG by reviewing available scientific information and by analyzing the impact of the proposed BEG on the existing management program for affected stocks. In addition, the review team will make a determination of whether there is substantive allocative impacts arising from management actions needed to achieve the proposed biological escapement goal.

If the team, by consensus, determines there is no substantive allocative impact arising from management actions to achieve the BEG, the proposed BEG will be submitted to the director of the division of primary management responsibility with a recommendation for its approval.

If the team cannot achieve a consensus, either with respect to the level of the BEG or the determination of allocative impact, the proposed BEG will be submitted to the division directors (and to the Commissioner, if necessary) for resolution.

If a determination of substantive allocative impact is made by the review team or a division director, the division directors will develop a joint proposal for the Commissioner to present to the Board of Fisheries to establish an optimal escapement goal and associated management plan to achieve the goal.

Cycle for Review of Existing Escapement Goals and Establishing New Escapement goals:

At a minimum, the department will review existing BEGs or propose new BEGs on a schedule that conforms to the Board of Fisheries triennial cycle of consideration of area regulatory proposals. Specific proposals for establishing and modifying BEGs will be developed, as appropriate within limits of available personnel, based on the availability of new scientific information and new techniques or programs for escapement enumeration.

Public Review and Implementation of Biological Escapement Goals:

Escapement Goals with Little or No Allocative Impact:

An effort to inform the public of any change in a biological escapement goal will be made. This process may include review of the change with Advisory Committees in the affected area and with user groups that depend on the affected stock.

Escapement Goals with Potentially Substantive Allocative Impact:

Whenever substantive allocation issues arise from proposed management actions needed to achieve a biological escapement goal, the department will request regulatory action from the Alaska Board of Fisheries to adopt a management plan for the fisheries involved. The management plan may identify an optimal escapement goal that differs from the proposed biological escapement goal to achieve the specific allocation objectives of the Board of Fisheries. The management plan will be drafted with departmental assistance and submitted to the Board of Fisheries for consideration.

The department will determine the biological escapement goals for the affected stocks, together with analyses of allocation impacts of alternative optimal escapement goals that the Board may consider.

In development of draft management plans for stocks with significant in-river fisheries, specific allocations to in-river fisheries will be added to the optimal escapement goal to set an in-river run goal. The fisheries outside the river will be managed to achieve the in-river run goal. The draft management plan will define specific action points and associated management actions for the department to follow in managing fisheries to meet the optimal escapement goal and/or the in-river run goal.

APPROVED:

R C Clasby — 10/16/92
Robert C. Clasby — Date
Acting Director, Division of Commercial Fisheries

Norval Netsch — 10/16/92
Norval Netsch — Date
Director, Sport Fish Division

Jeff Koenings — 10/16/92
Jeff Koenings — Date
Director, FRED Division

C Meacham — 10-16-92
Charles P. Meacham — Date
Deputy Commissioner, Alaska Department of Fish and Game

Carl L. Rosier — 10/21/92
Carl L. Rosier — Date
Commissioner, Alaska Department of Fish and Game

APPENDIX B. Chinook Salmon Escapement Goal Summary for Prince William Sound

Upper Copper River Chinook Salmon

Regulatory Area: Prince William Sound - Copper River District

Stock Unit: Upper Copper River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift Gillnet

Biological Escapement Goal: 15,000 chinook salmon (adopted 1972)

Optimal Escapement Goal: 15,000 chinook salmon (adopted 1980)

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1966.

History of Goal: Nine areas within the upper Copper River drainage are surveyed to provide an annual index of chinook salmon escapement:

East Fork Chistochina	Kiana Creek	Grayling Creek
Gulkana River	St. Anne Creek	Little Tonsina River
Mendeltna Creek	Manker Creek	Indian River

Salmon population estimates conducted by state and federal investigators during 1966 to 1972 suggested the average escapement into this drainage was 15,000 chinook salmon. Continued examination of escapement and return data suggest this level of escapement would sustain large runs. A 15,000 chinook salmon escapement goal was placed into regulation in 1980 when the Board of Fisheries adopted the *Copper River Personal Use Salmon Fishery Management Plan* (5 AAC 77.580). The personal use plan and the *Copper River Subsistence Salmon Fisheries Management Plan* (5 AAC 01.647) both set into regulation a combined escapement goal of 516,000 Pacific salmon for the upper Copper River to provide for spawning needs, hatchery uses, and in-river harvests. Neither plan distinguishes among salmon species for the purpose of setting overall subsistence or personal use harvest levels, but chinook salmon constitute a very small portion of these harvests. While a recreational harvest level for chinook salmon is provided in 5 AAC 77.580, it is neither defined as a maximum nor as a quota. So, while an in-river goal of 516,000 Pacific salmon exists, a specific in-river goal for chinook salmon has not been set.

Appendix C.1
Alexander Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Alexander Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 2,700 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1964.

History of Goal: Although aerial surveys of Alexander Creek have been conducted since 1964, only counts since 1979 are believed to be representative of escapements; this was when the stock recovered from low abundance levels and the recreational fishery was reestablished. Escapement index counts between 1979 and 1992 have ranged from 2,546 to 6,241 chinook salmon. No estimates were made in 1980 or 1981 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count for 12 years: 1979 and 1982–1992. A percentage of the average index count for these 12 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.2
Anchor River Chinook Salmon

Regulatory Area: Cook Inlet - Kenai Peninsula Area

Stock Unit: Anchor River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 1,790 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts of a lower-middle river index area have been made during foot surveys since 1962, during rotary-wing aerial surveys since 1974, and during fixed-wing aerial surveys from 1962 to 1974.

History of Goal: Escapement index counts between 1962 and 1991 have ranged from 530 to 4,350 chinook salmon. No escapement estimate was made in 1992. The biological escapement goal is an average of the annual aerial and foot survey index counts conducted over the past 26 years: 1966–1991. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.3
Campbell Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Campbell Creek

Management Division: Sport Fish

Primary Fishery: No directed fishery on this stock

Biological Escapement Goal: 250 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1958.

History of Goal: Escapement index counts between 1958 and 1992 have ranged from 6 to 931 chinook salmon. The biological escapement goal is an average of the foot survey index counts conducted over 24 years: 1958, 1961–1968, 1970–1974, 1976, 1977, 1982, 1984, 1986, 1987, and 1989–1992. No surveys were conducted in 1959, 1969, 1975, 1978–1981, 1983, 1985, and 1988. The goal represents an index, rather than an estimate, of total spawner abundance. Although Campbell Creek is closed to sport fishing for chinook salmon, some returning adults may be harvested in other Cook Inlet recreational and commercial fisheries.

Appendix C.4
Chuitna River Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Chuitna (Chuit) River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 1,400 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1979.

History of Goal: Escapement index counts between 1979 and 1992 have ranged from 480 to 4,043 chinook salmon. No estimates were made during 1980, 1982, or 1987 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 11 years: 1979, 1982–1986, and 1988–1992. A percentage of the average index count for these 11 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.5
Chulitna River Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Chulitna River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 2,000 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1982.

History of Goal: Escapement index counts between 1982 and 1992 have ranged from 644 to 5,252 chinook salmon. No estimates were made during 1986, 1988, or 1989 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 8 years: 1982–1985, 1987, and 1990–1992. A percentage of the average index count for these 8 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.6
Clear Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Clear Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 1,300 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1979.

History of Goal: Escapement index counts between 1979 and 1992 have ranged from 864 to 4,850 chinook salmon. No estimates were made during 1980, 1981, 1986, or 1989 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 9 years: 1979, 1982–1985, 1987, 1988, and 1990–1992. A percentage of the average index count for these 9 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.7
Deep Creek Chinook Salmon

Regulatory Area: Cook Inlet - Kenai Peninsula Area

Stock Unit: Deep Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 950 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts of a lower-middle river index area have been made during foot surveys since 1962, rotary-wing aerial surveys since 1974, and fixed-wing aerial surveys from 1962 to 1974.

History of Goal: Escapement index counts between 1962 and 1991 have ranged from 200 to 3,320 chinook salmon. No surveys were conducted in 1970 or 1971. The biological escapement goal is an average of the annual estimates from aerial and foot survey index counts conducted over 24 years: 1966–1969 and 1972–1991. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.8
Deshka River Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Deshka River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 11,200 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1964.

History of Goal: Although aerial surveys of Alexander Creek have been conducted since 1964, only counts since 1979 are believed to be representative of escapements; this was when the stock recovered from low abundance levels and the recreational fishery was reestablished. Escapement index counts between 1979 and 1992 have ranged from 7,736 to 27,385 chinook salmon. No estimates were made during 1980, 1981, or 1989 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 11 years: 1979, 1982–1988, and 1990–1992. A percentage of the average index count for these 11 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.9
Eagle River South Fork Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Eagle River, South Fork

Management Division: Sport Fish

Primary Fishery: No directed fishery on this stock

Biological Escapement Goal: 300 chinook salmon (adopted 1992)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1963.

History of Goal: This system has a mix of wild and hatchery stocks. Enhancement efforts began in 1990. Although the South Fork is closed to sport fishing, the department manages the recreational fishery in the mainstem of the river, reopened in 1992, to reserve a total of 300 chinook salmon for spawning (Delaney and Vincent-Lang 1992). The biological escapement goal is greater than the average foot survey index count (168 chinook salmon) for 15 years: 1963–1968, 1970, 1973, 1976, 1977, 1986, and 1989–1992. Escapement index counts between 1963 and 1992 have ranged from 28 to 513 chinook salmon. No surveys were conducted in 1969, 1971, 1972, 1974, 1975, 1978–1985, 1987, or 1988. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.10
Goose Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Goose Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 350 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1981.

History of Goal: Escapement index counts between 1981 and 1992 have ranged from 140 to 1,076 chinook salmon. The biological escapement goal represents 66% of the average aerial survey index count conducted over 12 years: 1981–1992. A percentage of the average index count for these 12 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.11
Kenai River Early-Run Chinook Salmon

Regulatory Area: Cook Inlet - Kenai Peninsula Area

Stock Unit: Kenai River - Early Run (escapement obtained through 30 June)

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 9,000 chinook salmon (adopted 1989)

Optimal Escapement Goal: 9,000 chinook salmon (adopted 1989)

In-River Goal: None

Action Points:

Less than 5,300 chinook salmon (adopted 1989)	Chinook salmon in-river recreational fishery is closed
Between 5,300 and 9,000 chinook salmon (adopted 1988)	Chinook salmon in-river recreational fishery is restricted to single-hook artificial lures, time and area reductions, and catch-and-release fishing (except for retention of chinook salmon only 52 inches or larger)
At and above 9,000 chinook salmon (adopted 1988)	Use of bait for in-river recreational chinook salmon fishery is permitted, and time and bag limits revert to those published in regulation

Escapement Enumeration Methods: Counts have been made since 1987 from dual-beam hydroacoustic equipment placed on both sides of the Kenai River at river mile 8.5. Mark-and-recapture population estimates were made in 1985 and 1986.

History of Goal: An escapement goal for this stock was adopted under regulation as the *Kenai River Early Chinook Salmon Management Plan* (5 AAC 56.070) by the Alaska Board of Fisheries in 1988. The plan has been applied since 1989 for management of the in-river recreational fishery. The goal was based on only 3 years of total return data. Using an average return-per-spawner value of 3, obtained from a review of available literature, the Board chose to manage for the largest observed total return of 27,000 chinook salmon when it adopted an optimal escapement goal of 9,000 chinook salmon. The Board also set a minimum goal of 5,300 chinook salmon to help ensure the total return would not fall below the smallest observed value of 16,000 chinook salmon.

Appendix C.12
Kenai River Late-Run Chinook Salmon

Regulatory Area: Cook Inlet - Kenai Peninsula Area

Stock Unit: Kenai River - Late Run (escapement obtained after 30 June)

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 22,300 chinook salmon (adopted 1988)

Optimal Escapement Goal: 22,300 chinook salmon (adopted 1988)

In-River Goal: None

Action Points:

Less than 15,500 chinook salmon (adopted 1988)	Chinook salmon in-river recreational fishery is closed; chinook salmon marine recreational fishery north of Bluff Point is closed; commercial set gillnet fishery in Upper Subdistrict of Central District is closed; commercial drift gillnet fishery in Central District is closed within 3 miles of shore
Between 15,500 and 22,300 chinook salmon (adopted 1988)	Chinook salmon in-river recreational fishery is restricted to single-hook artificial lures, time and area reductions, and catch-and-release fishing (except for retention of chinook salmon only 52 inches or larger)
Between 15,500 and 19,000 chinook salmon (adopted 1988)	Commercial set gillnet fishery in Upper Subdistrict of Central District limited to regular periods; commercial drift gillnet fishery in Central District limited to regular periods within 3 miles of shore; however, if Kenai River sockeye salmon sonar count is projected to exceed 700,000, neither the commercial set nor drift gillnet fisheries will be restricted unless chinook salmon escapement is projected to be less than 15,500
At and above 22,300 chinook salmon (adopted 1988)	Use of bait for in-river recreational chinook salmon fishery is permitted, and time and bag limits revert to those published in regulation. Commercial set and drift gillnet fisheries are not constrained by chinook salmon considerations

Escapement Enumeration Methods: Counts have been made since 1987 from dual-beam hydroacoustic equipment placed on both sides of the Kenai River at river mile 8.5. Mark-recapture estimates were made from 1984 to 1986.

History of Goal: An escapement goal for this stock was adopted under regulation as the *Kenai River Late Chinook Salmon Management Plan* (5 AAC 21.359) by the Alaska Board of Fisheries in 1988. The plan has been applied since 1989 for management of the in-river recreational fishery. The goal was based on only 4 years of total return data for which total returns ranged from 46,500 to 80,000 chinook salmon. Using an average return-per-spawner value of 3, obtained from a review of available literature, the Board chose to manage for the average observed total return of 66,900 chinook salmon when it adopted an optimal escapement goal of 22,300 chinook salmon. The Board also set a minimum goal of 15,500 chinook salmon to help ensure the total return would not fall below the smallest observed value of 46,500 chinook salmon.

Appendix C.13
Lake Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Lake Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 2,900 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1964.

History of Goal: Although aerial surveys of Alexander Creek have been conducted since 1964, only counts since 1979 are believed to be representative of escapements; this was when the stock recovered from low abundance levels and the recreational fishery was reestablished. Escapement index counts between 1979 and 1992 have ranged from 2,075 to 7,075 chinook salmon. No estimates were made during 1980, 1981, 1984, 1986, or 1989 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 9 years: 1979, 1982, 1983, 1985, 1987, 1988, and 1990–1992. A percentage of the average index count for these 9 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.14
Lewis River Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Lewis River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 400 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1979.

History of Goal: Escapement index counts between 1979 and 1992 have ranged from 207 to 947 chinook salmon. No estimates were made during 1980 and 1983 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 12 years: 1979, 1981, 1982, and 1984–1992. A percentage of the average index count for these 12 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.15
Little Susitna River Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Little Susitna River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 850 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made during rotary-wing aerial and foot surveys since 1983. Visual counts were made at a weir in 1988 and 1989.

History of Goal: Escapement index counts between 1983 and 1992 have ranged from 558 to 3,197 chinook salmon. No aerial estimates were made during 1986 and 1989 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 8 years: 1983–1985, 1987, 1988, and 1990–1992. A percentage of the average index count for these 8 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance. For 1988, the only year counts from both an aerial survey and a weir were available, the aerial survey count represented only 43% of the total weir count.

Appendix C.16
Little Willow Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Little Willow Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 650 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1979.

History of Goal: Escapement index counts between 1979 and 1992 have ranged from 316 to 2,133 chinook salmon. No estimates were made during 1980 and 1984 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 12 years: 1979, 1981–1983, and 1985–1992. A percentage of the average index count for these 12 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.17
Montana Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Montana Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 1,100 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1979.

History of Goal: Escapement index counts between 1979 and 1992 have ranged from 814 to 2,701 chinook salmon. No estimates were made during 1980 and 1986 due to inclement weather or poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 12 years: 1979, 1981–1985, and 1987–1992. A percentage of the average index count for these 12 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.18
Ninilchik River Chinook Salmon

Regulatory Area: Cook Inlet - Kenai Peninsula Area

Stock Unit: Ninilchik River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 830 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts of a lower-middle river index area have been made during foot surveys since 1962, rotary-wing aerial surveys since 1974, and fixed-wing aerial surveys from 1962 to 1974.

History of Goal: This system has a mix of wild and hatchery stocks. Enhancement efforts began in 1988. Escapement index counts between 1962 and 1991 have ranged from 360 to 1,430 chinook salmon. No surveys were conducted in 1970 and 1972, and no escapement estimate was made in 1992. The biological escapement goal is the average of the annual estimates, based on aerial and foot survey index counts, conducted over 24 years: 1966–1969 and 1972–1991. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.19
Peters Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Peters Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 1,300 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1983.

History of Goal: Escapement index counts between 1983 and 1992 have ranged from 324 to 3,927 chinook salmon. The biological escapement goal represents 66% of the average aerial survey index count conducted over 10 years: 1983–1992. A percentage of the average index count for these 10 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.20
Prairie Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Prairie Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 4,700 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1982.

History of Goal: Escapement index counts between 1982 and 1992 have ranged from 3,200 to 9,463 chinook salmon. The biological escapement goal represents 66% of the average aerial survey index count conducted over 11 years: 1982–1992. A percentage of the average index count for these 11 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.21
Sheep Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Sheep Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1979.

History of Goal: Escapement index counts between 1979 and 1991 have ranged from 527 to 1,634 chinook salmon. No estimates were made during 1980 and 1992 due to inclement weather and poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 12 years: 1979, and 1981–1991. A percentage of the average index count for these 12 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.22
Ship Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Ship Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 250 chinook salmon (adopted 1992)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys and at a water-control structure located in the Chugach Electric Association water-intake dam since 1960.

History of Goal: This system has a mix of wild and hatchery stocks. Enhancement efforts began in the early 1960s. Escapement counts between 1960 and 1992 have ranged from 50 to 1,746 chinook salmon. The department manages the recreational fishery to reserve a total of 500 chinook salmon for spawning/ viewing (250 chinook salmon) and hatchery broodstock (250 chinook salmon) requirements (Delaney and Vincent-Lang 1992). The biological escapement goal represents about 50% of the average count (479 chinook salmon), not including the chinook salmon removed for hatchery broodstock, conducted over 29 years: 1960–1982, 1986, 1987, and 1989–1992. No surveys were conducted in 1980, 1983–1985, or 1988.

Appendix C.23
Talachulitna River Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Talachulitna River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 2,700 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made from rotary-wing aerial surveys since 1979.

History of Goal: Escapement index counts between 1979 and 1992 have ranged from 1,648 to 10,014 chinook salmon. No estimates were made during 1980, 1987, or 1989 due to inclement weather and poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 11 years: 1979, 1981–1986, 1988, and 1990–1992. A percentage of the average index count for these 11 years was used to represent the biological escapement goal since, department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.24
Theodore River Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Theodore River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 750 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during rotary-wing aerial surveys since 1979.

History of Goal: Escapement index counts between 1979 and 1992 have ranged from 508 to 1,906 chinook salmon. No estimates were made during 1980 due to inclement weather and poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count conducted over 13 years: 1979 and 1981–1992. A percentage of the average index count for these 13 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix C.25
Willow Creek Chinook Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Willow Creek (including Deception Creek)

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 1,750 chinook salmon (adopted 1993)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts of Willow and Deception Creeks have been made during rotary-wing aerial and foot surveys, respectively, since 1979.

History of Goal: This system has a mix of wild and hatchery stocks. Hatchery-reared Willow Creek drainage chinook salmon smolts have been released into Deception Creek since 1985. Between 1979 and 1992, the combined escapement index count for both creeks has ranged from 821 to 5,860 chinook salmon. No estimates were made for either creek during 1980 due to inclement weather and poor water clarity. The biological escapement goal represents 66% of the average aerial survey index count for 13 years: 1979 and 1981–1992. A percentage of the average index count for these 13 years was used to represent the biological escapement goal, since department biologists working in the system felt that escapements achieved during this time period were generally above the level needed to sustain high average long-term production. The goal represents an index, rather than an estimate, of total spawner abundance.

Appendix D.1
Naknek River Chinook Salmon

Regulatory Area: Bristol Bay - Bristol Bay Area

Stock Unit: Naknek River

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 5,000 chinook salmon (adopted 1994)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of major spawning areas have been made during fixed-wing aerial surveys since 1970.

History of Goal: Escapement index counts between 1962 and 1992 have ranged from 351 to 7,380 chinook salmon for the mainstem Naknek River, 7 to 400 chinook salmon for Paul's Creek, 100 to 1,860 chinook salmon for King Salmon Creek, and 490 to 4,220 chinook salmon for Big Creek (Coggins and Bingham 1993). No surveys of the mainstem Naknek River were conducted in 1974 and 1978; of Paul's Creek in 1970, 1973, 1977–1979, 1981, and 1985; of King Salmon Creek in 1978–1980 and 1985; and of Big Creek in 1977–1979 and 1985. The biological escapement goal is the sum of the average counts, rounded to the nearest thousand, for the mainstem Naknek River for 20 years (1970–1973, 1975–1977, and 1980–1992), Paul's Creek for 16 years (1971, 1972, 1974–1976, 1980, 1982–1984, and 1986–1992), King Salmon Creek for 19 years (1970–1977, 1981–1984, and 1986–1992), and Big Creek for 19 years (1970–1976, 1980–1984, and 1986–1992). The biological escapement goal represents an index, rather than an estimate, of the total escapement for this system.

Appendix D.2
Nushagak River Chinook Salmon

Regulatory Area: Bristol Bay - Nushagak District

Stock Unit: Nushagak River (includes Mulchatna and Nuyakuk Rivers)

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 65,000 chinook salmon (adopted 1992)

Optimal Escapement Goal: 65,000 chinook salmon (adopted 1992)

In-River Goal: 75,000 chinook salmon (optimal escapement goal in addition to 5,000 chinook salmon for subsistence harvest and 5,000 chinook salmon for sport harvest—adopted 1992)

Action Points:

Less than 40,000 chinook salmon (adopted 1992)	Chinook salmon commercial and recreational fisheries are closed; chinook salmon in-river subsistence harvest is restricted; sockeye salmon commercial fishery is closed if less than 100,000 sockeye salmon have escaped into the Wood River system
More than 40,000, but less than 65,000 chinook salmon (adopted 1992)	Chinook salmon commercial fishery is closed; chinook salmon recreational fishery is restricted
Less than 75,000 chinook salmon (adopted 1992)	Chinook salmon commercial fishery is closed
75,000 to 95,000 chinook salmon (adopted 1992)	Recreational harvest is not to exceed 6,000 chinook salmon

Escapement Enumeration Methods: Counts have been made since 1980 from single-beam hydroacoustic equipment, placed on both sides of the Nushagak River below Portage Creek, in conjunction with drift gillnet test fishing. Visual counts were made from fixed-wing aerial surveys from 1968 to 1985, and from towers, placed on both banks of the Nushagak River, in 1966 and 1967.

History of Goal: From the late 1970s until 1984, the department tried to obtain escapements of at least 50,000 to 60,000 chinook salmon into the Nushagak River drainage. In 1984, a goal of 75,000 and a management range of 50,000 to 100,000 chinook salmon were set. This was actually an in-river goal that allowed sport and subsistence harvests. Ricker models indicated an escapement of about 60,000 chinook salmon would produce maximum sustained yield, while 95% percent of this yield could be obtained by allowing escapements to vary within a range of about 40,000 to 80,000. Reevaluation of the goal in 1991, again primarily based on Ricker models, indicated the biological escapement goal should be 65,000 chinook salmon. This goal was used in the *Nushagak-Mulchatna Chinook Salmon Management Plan* (5 AAC 06.361), adopted in 1992, which included an in-river goal as well as action points.

Appendix D.3
Togiak River Chinook Salmon

Regulatory Area: Bristol Bay - Togiak District

Stock Unit: Togiak River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 10,000 chinook salmon (adopted 1991)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made from fixed-wing aerial surveys since 1967.

History of Goal: Methods and rationales for setting this goal were not documented in 1991, but a 1994 review of all available brood year data from 1980-1987 (Beverly Cross, Bristol Bay Research Project Leader, Commercial Fisheries Management and Development Division, Alaska Department of Fish and Game, Anchorage, personal communication) indicated this level of escapement should sustain an average annual run of 19,700 chinook salmon, if the average return per spawner of 1.87 for these brood years continues to be realized. An average run of this size would be similar to the average annual run of 18,400 chinook salmon actually observed for these brood years.

Appendix E.1
Coghill District Chum Salmon

Regulatory Area: Prince William Sound - Coghill District

Stock Unit: Coghill District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift Gillnet and Purse Seine

Biological Escapement Goal: 29,600 to 37,050 chum salmon (adopted 1977)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 13 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 13 systems surveyed represent 20%–25% of all anadromous streams in this district and comprise 75%–85% of the district's total chum salmon escapement:

Triple Creek	Avery River	Hobo Creek	Hummer Creek
Swanson Creek	Village Creek	Coghill River	Mill Creek
Pirate Creek	Golden Lagoon	Harrison Creek	Old Creek
Meacham Creek			

An escapement goal, represented as a range, was first reported by Pirtle (1978) for the 1977 season. This goal was reported as a combined goal for the Coghill and Northwestern Districts, and may have been in place since at least 1960. While the goal has remained unchanged, it has been divided between the 2 districts as they are currently described. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimation procedures, as well as spawning goals, will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix E.2
Eastern District Chum Salmon

Regulatory Area: Prince William Sound - Eastern District

Stock Unit: Eastern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 87,200 to 109,000 chum salmon (adopted 1977)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 52 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 52 systems surveyed represent 20%–25% of all anadromous streams in this district and comprise 75%–85% of the district's total chum salmon escapement:

Hartney Creek	Pass Creek	Irish Creek	Black Creek
Gorge Creek	Eccles Creek	Plateau Creek	Whalen Creek
Turner Creek	Sawmill Creek	Fleming Creek	Comfort Creek
Keta Creek	Millard Creek	Lowe River	Humpy Creek
Beartrap Creek	Sunny River	Duck River	Siwash Creek
Twin Lakes Creek	Cataract Creek	Short Creek	Indian Creek
Crooked Creek	Spring Creek	Olsen Creek	Fish Creek
Donaldson Creek	Mineral Flats	Rogue Creek	Control Creek
Shale Creek	Levshakoff Creek	Twin Falls Creek	Chase Creek
Carlsen Creek	Kirkwood Creek	No Name Creek	Stellar Creek
Koppen Creek	St. Matthews Creek	Rock Creek	Gregorieff Creek
Sheep River	Two Moon Creek	Lagoon Creek	Naomoff River
Allen Creek	Tundra Creek	Gladhough Creek	Vlasoff Creek

An escapement goal, represented as a range, was first reported by Pirtle (1978) for the 1977 season. This same goal may have been in place since at least 1960 and has remained unchanged. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimation procedures, as well as spawning goals, will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix E.3
Montague District Chum Salmon

Regulatory Area: Prince William Sound - Montague District

Stock Unit: Montague District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 11,400 to 14,250 chum salmon (adopted 1977)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 33 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 33 systems surveyed represent 20%–25% of all anadromous streams in this district and comprise 75%–85% of the district's total chum salmon escapement:

Montague Island #1 (Stream 717)	Point Creek	Kelez Creek	Stockdale Creek
Montague Island #2 (Stream 718)	Chalmers River	Stockdale Bay	Shad Creek
Montague Island #3 (Stream 719)	Rosswog Creek	Russell Creek	Cabin Creek
Montague Island #4 (Stream 722)	Swamp Creek	Gilmour Creek	Udall Creek
Montague Island #5 (Stream 724)	McKernan Creek	Carr Creek	Clam Beach Creek
Montague Island #6 (Stream 725)	MacLeod Creek	Wilby Creek	Dry Creek
Pautze Creek	Hanning Creek	Wild Creek	Green Creek
Rocky Bay Head	Quadra Creek	Montague Creek	Schuman Creek
Rocky Creek			

An escapement goal, represented as a range, was first reported by Pirtle (1978) for the 1977 season. This goal may have been in place since at least 1960 and has remained unchanged. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimation procedures, as well as spawning goals, will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix E.4
Northern District Chum Salmon

Regulatory Area: Prince William Sound - Northern District

Stock Unit: Northern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 29,400 to 36,750 chum salmon (adopted 1977)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 30 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 30 systems surveyed represent 20%–25% of all anadromous streams in this district and comprise 75%–85% of the district's total chum salmon escapement:

Heather Bay	Vanishing Creek	Cedar Creek	Williams Creek
Siwash River	Granite Cove	Spring Creek	Delta Creek
Waterfall Creek	Unakwik Creek	Useless Creek	Billy's Creek
Surplus Creek	Canyon Creek	Schoppe Creek	Elf Creek
Eickelberg Creek	Wells River	Good Creek	Black Bear Creek
Bench Mark Creek	Backyard Creek	12565 Creek	Bad Creek
Dead Creek	Long Creek	Granite Creek	Complex Creek
Derickson Creek	Comeback Creek		

An escapement goal, represented as a range, was first reported by Pirtle (1978) for the 1977 season. This same goal may have been in place since at least 1960 and has remained unchanged. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimation procedures, as well as spawning goals, will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix E.5
Northwestern District Chum Salmon

Regulatory Area: Prince William Sound - Northwestern District

Stock Unit: Northwestern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 19,000 to 23,700 chum salmon (adopted 1977)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 17 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 17 systems surveyed represent 20%–25% of all anadromous streams in this district and comprise 75%–85% of the district's total chum salmon escapement:

Logging Camp Creek	Paulson Creek	Narrows Creek	East Finger Creek
McClure Creek	Tebenkoff Creek	Parks Creek	Shrode Creek
West Finger Creek	Blackstone Creek	Cochran Creek	Culross Creek
Most Creek	Halferty Creek	Wickett Creek	Mink Creek
Chimevisky Lagoon			

An escapement goal, represented as a range, was first reported by Pirtle (1978) for the 1977 season. This goal was reported as a combined goal for the Coghill and Northwestern Districts, possibly in place since at least 1960. While the goal has remained unchanged, it has been divided between the 2 districts as they are currently described. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimation procedures, as well as spawning goals, will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix E.6
Southeastern District Chum Salmon

Regulatory Area: Prince William Sound - Southeastern District

Stock Unit: Southeastern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 20,000 to 25,000 chum salmon (adopted 1977)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 31 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 31 systems surveyed represent 20%–25% of all anadromous streams in the district and comprise 75%–85% of the district's total chum salmon escapement:

Port Etches-South Shore	Constantine Creek	King Creek	Widgeon Creek
Orca Creek	Clamdiggers Creek	Dog Salmon Creek	Deer Creek
Double Creek	Goose Creek	Zillesenoff Creek	Beaver Creek
Juania Creek	Bates Creek	Makaka Creek	West Lagoon Creek
Garden Creek	Hardy Creek	Hawkins Bay	Etches Creek
East Lagoon Creek	Scott Creek	Rollins Creek	Nuchek Creek
Cook Creek	North Lagoon Creek	Dan's Creek	Canoe Creek
Bernard Creek	Captain Creek	Brown Bear Creek	

An escapement goal, represented as a range, was first reported by Pirtle (1978) for the 1977 season. This same goal may have been in place since at least 1960 and has remained unchanged. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimates and spawning goals are currently being re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix E.7
Southwestern District Chum Salmon

Regulatory Area: Prince William Sound - Southwestern District

Stock Unit: Southwestern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 3,400 to 4,250 chum salmon (adopted 1977)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 27 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 27 systems surveyed represent 20%–25% of all anadromous streams in this district and comprise 75%–85% of the district's total chum salmon escapement:

Paddy Creek	Jackpot Bay #1	Claw Creek	Halverson Creek
Horseshoe Creek	Nacktan Creek	Jackpot Bay #2	Pablo Creek
Bjorne Creek	Hayden Creek	Ewan Creek	Jackson Creek
Whale Bay #1	O'Brien Creek	Snug Harbor	Erb Creek
Totemoff Creek	Whale Creek	Montgomery Creek	Jackpot River
Brizgaloff Creek	Hogg Creek	Latouche Island	Kompkoff River
Bainbridge Creek	Johnson Creek	Falls Creek	

An escapement goal, represented as a range, was first reported by Pirtle (1978) for the 1977 season. This goal was reported as a combined goal for the Eshamy and Southwestern Districts and may have been in place since at least 1960. While the goal has remained unchanged, it is now used only for the Southwestern District as the district is currently described. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimation procedures and spawning goals will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix F.1
Big Kamishak River Chum Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Big Kamishak River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 20,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	20 to 50	1982	20	1985	20	1988	20	1991	20
1980	20 to 50	1983	20	1986	20	1989	20	1992	20
1981	20 to 50	1984	20	1987	20	1990	20	1993	20

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance. From 1979 to 1981, an upper-range goal of 5,000 chum salmon was used whenever a large number of chum salmon moved upstream to spawn.

Appendix F.2
Bruin River Chum Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Bruin River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 to 10,000 chum salmon (adopted 1988)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	5 to 10	1982	5	1985	5	1988	5 to 10	1991	5 to 10
1980	5 to 10	1983	5	1986	5	1989	5 to 10	1992	5 to 10
1981	5 to 10	1984	5	1987	5	1990	5 to 10	1993	5 to 10

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance. From 1979 to 1981, an upper-range goal of 10,000 chum salmon was used whenever a large number of chum salmon moved upstream to spawn.

Appendix F.3
Clearwater Creek Chum Salmon

Regulatory Area: Cook Inlet - Central District

Stock Unit: Clearwater Creek - Chinitna Bay

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet; Purse Seine

Biological Escapement Goal: 10,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since the 1970s.

History of Goal: The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance.

Appendix F.4
Cottonwood Creek (Kamishak) Chum Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Cottonwood Creek (Kamishak)

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	10 to 15	1982	10	1985	10	1988	10	1991	10
1980	10 to 15	1983	10	1986	10	1989	10	1992	10
1981	10 to 15	1984	10	1987	10	1990	10	1993	10

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance.

Appendix F.5
Dogfish Lagoon Chum Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Dogfish Lagoon

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 to 10,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys and foot surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	10 to 15	1982	5 to 10	1985	5 to 10	1988	5 to 10	1991	5 to 10
1980	10 to 15	1983	5 to 10	1986	5 to 10	1989	5 to 10	1992	5 to 10
1981	10 to 15	1984	5 to 10	1987	5 to 10	1990	5 to 10	1993	5 to 10

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance.

Appendix F.6
Iniskin River Chum Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Iniskin River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	10 to 15	1982	10	1985	10	1988	10	1991	10
1980	10 to 15	1983	10	1986	10	1989	10	1992	10
1981	10 to 15	1984	10	1987	10	1990	10	1993	10

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance.

Appendix F.7
Island Creek Chum Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Island Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 to 15,000 chum salmon (adopted 1979)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since the early 1970s.

History of Goal: The current goal for this system has not been changed since it was first presented to the Alaska Board of Fisheries in 1979. The goal was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance.

Appendix F.8
Little Kamishak River Chum Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Little Kamishak River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 20,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	20 to 30	1982	20	1985	20	1988	20	1991	20
1980	20 to 30	1983	20	1986	20	1989	20	1992	20
1981	20 to 30	1984	20	1987	20	1990	20	1993	20

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance. From 1979 to 1981, an upper-range goal of 30,000 chum salmon was used whenever a large number of chum salmon moved upstream to spawn.

Appendix F.9
McNeil River Chum Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: McNeil River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 20,000 to 40,000 chum salmon (adopted 1988)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since about 1973.

History of Goal: Published goals (in thousands of chum salmon):

1979	20 to 50	1982	10 to 20	1985	10 to 20	1988	20 to 40	1991	20 to 40
1980	20 to 50	1983	10 to 20	1986	10 to 20	1989	20 to 40	1992	20 to 40
1981	20 to 50	1984	10 to 20	1987	10 to 20	1990	20 to 40	1993	20 to 40

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement (Bucher et al. 1993). Since escapement counts are peak aerial survey counts rather than total counts, the goal represents an index, rather than an estimate, of total spawner abundance. Presently, an upper-range goal of 40,000 chum salmon is used whenever a large number of chum salmon moves above the falls to spawn.

Appendix F.10
Petrof River Chum Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Petrof River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 2,000 to 5,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since the early 1970s.

History of Goal: The current goal for this system has not been changed since first presented to the Alaska Board of Fisheries in 1982. The goal was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance.

Appendix F.11
Port Dick Chum Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Port Dick (Head End Creek)

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 4,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been used made during foot surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	4 to 5	1982	4	1985	4	1988	4	1991	4
1980	4 to 5	1983	4	1986	4	1989	4	1992	4
1981	4 to 5	1984	4	1987	4	1990	4	1993	4

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance. From 1979 to 1981, an upper-range goal of 5,000 chum salmon was used whenever a large number of chum salmon moved upstream to spawn.

Appendix F.12
Port Graham River Chum Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Port Graham River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 4,000 to 8,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	4 to 5	1982	4 to 8	1985	4 to 8	1988	4 to 8	1991	4 to 8
1980	4 to 5	1983	4 to 8	1986	4 to 8	1989	4 to 8	1992	4 to 8
1981	4 to 5	1984	4 to 8	1987	4 to 8	1990	4 to 8	1993	4 to 8

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance.

Appendix F.13
Rocky River Chum Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Rocky River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 20,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	20 to 40		1982	20		1985	20		1988	20		1991	20
1980	20 to 40		1983	20		1986	20		1989	20		1992	20
1981	20 to 40		1984	20		1987	20		1990	20		1993	20

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance. From 1979 to 1981, an upper-range goal of 40,000 chum salmon was used whenever a large number of chum salmon moved upstream to spawn.

Appendix F.14
Ursus Cove Chum Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Ursus Cove

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 to 10,000 chum salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since the early 1970s.

History of Goal: Published goals (in thousands of chum salmon):

1979	8 to 12	1982	5 to 10	1985	5 to 10	1988	5 to 10	1991	5 to 10
1980	8 to 12	1983	5 to 10	1986	5 to 10	1989	5 to 10	1992	5 to 10
1981	8 to 12	1984	5 to 10	1987	5 to 10	1990	5 to 10	1993	5 to 10

The current goal for this system was based on a subjective assessment of spawning area and commercial harvests resulting from various levels of escapement. Since escapements were peak aerial survey counts rather than total estimates, the goal represents an index, rather than an estimate, of total spawner abundance.

Appendix G.1
Bering River Delta Coho Salmon

Regulatory Area: Prince William Sound - Bering River District

Stock Unit: Bering River Delta

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift Gillnet

Biological Escapement Goal: 23,000 coho salmon (range: 13,000 to 33,000; adopted 1991)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of various systems have been made during fixed-wing aerial surveys since 1971.

History of Goal: Nine survey sites are thought to represent a large proportion of the total coho salmon escapement on the Bering River Delta:

Katalla River	Shepard Creek	Campbell River (Controller Bay)
Dick Creek	Nichawak River	Edwards River (Controller Bay)
Bering River/Lake (including Don Miller Hill tributaries)	Gandil River	Okalee River (Controller Bay)

Since 1984, aerial surveys of the above sites have been flown on a weekly basis. The goal was calculated as the mean aerial survey peak index count for 8 years: 1984–1991. Range limits were set as lower and upper values of the 80% confidence interval about the mean. The goal represents an index, rather than a total estimate, of spawner abundance. Surveys are often hindered by wind and rain, as well as by high and turbid water. While this goal should support a sustainable harvest, the goal that produces maximum sustained yield is not known.

Appendix G.2
Copper River Delta Coho Salmon

Regulatory Area: Prince William Sound - Copper River District

Stock Unit: Copper River Delta

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift Gillnet

Biological Escapement Goal: 50,000 coho salmon (range: 32,000 to 67,000; adopted 1991)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of various sites have been made during fixed-wing aerial surveys since 1964.

History of Goal: Twenty-one survey sites are thought to represent a large proportion of the total coho salmon escapement on the Copper River Delta:

Eyak River/Lake	18/20 Mile	Pleasant Creek	Tokun Springs
Hatchery Creek	McKinley Lake	Martin River	Tokun River/Lake
Power Creek	Salmon Creek	Ragged Point River/Lake	Martin River Slough
Ibek Creek	26/27 Mile Creek	Martin Lake	Scott River
39 Mile Creek	Pothole River/Lake	Alganik Slough	Goat Mountain Creek
Little Martin River/Lake			

Since 1984, aerial surveys of 20 of the above sites have been flown on a weekly basis. Two systems, Scott River and Alganik Slough, have only been surveyed since 1988. The goal was calculated as the mean aerial survey peak index count for 8 years: 1984–1991. Range limits were set as lower and upper values of the 80% confidence interval about the mean. The goal represents an index, rather than a total estimate, of spawner abundance. Surveys are often hindered by wind and rain, as well as by high and turbid water. While this goal should support a sustainable harvest, the goal that produces maximum sustained yield is not known.

Appendix H.1
Campbell Creek Coho Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Campbell Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 200 coho salmon (adopted 1994)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys and at a weir since 1986.

History of Goal: This system has a mix of wild and hatchery stocks. Enhancement efforts began in 1992. Escapement counts between 1986 and 1992 have ranged from 99 to 282 coho salmon. The average escapement from weir and foot survey counts for the 7 years the surveys were conducted, 1986, 1987 and 1990–1992, was 159 coho salmon. The biological escapement goal was set above this average value, since biologists familiar with the system felt it was capable of supporting a greater number of spawners. Campbell Creek was reopened to sport fishing in 1993 following a 21-year closure.

Appendix H.2
Cottonwood Creek (Knik Arm) Coho Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Cottonwood Creek (Knik Arm)

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 300 coho salmon (adopted 1994)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of index sites have been made during foot surveys since 1968.

History of Goal: While index counts during foot surveys have been conducted since 1968, surveys within standard index areas have only been performed since 1974. Between 1980 and 1992, index counts have ranged from 6 to 935 coho salmon. The biological escapement goal represents the average foot survey index count conducted over 18 years: 1974–1978 and 1980–1992. Only a partial survey was conducted in 1979; the resulting estimate has not been used in escapement goal calculations. The goal represents an index, rather than a total estimate, of spawner abundance.

Appendix H.3
Fish Creek (Knik Arm) Coho Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Fish Creek (Knik Arm)

Management Division: Sport Fish

Primary Fishery: Recreational and Personal Use

Biological Escapement Goal: 2,700 coho salmon (adopted 1994)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts near the mouth of Fish Creek have been made at a weir since 1968. Visual counts have been performed irregularly during foot surveys since the 1930s.

History of Goal: Annual counts at a weir have ranged from 210 to 8,924 coho salmon. The biological escapement goal is the average weir count conducted over 23 years: 1969 and 1972–1992. Coho salmon counts for 1968, 1970, and 1971 were not considered to represent total escapement estimates since the weir was not operated through 15 August, the date by which most of the coho salmon run has entered the system.

Appendix H.4
Jim Creek Coho Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Jim Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 830 coho salmon (adopted 1994)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts of McRoberts Creek, a tributary of Jim Creek, and an index area in upper Jim Creek have been made during foot surveys since 1985 and 1990, respectively.

History of Goal: Escapement index counts between 1985 and 1992 have ranged from 70 to 1,911 coho salmon. The biological escapement goal represents the average foot survey count conducted over 8 years: 1985–1992. Counts represent an index, rather than an estimate, of total escapement into the system.

Appendix H.5
Little Susitna River Coho Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Little Susitna River (Upstream of Parks Highway bridge)

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 7,500 coho salmon (upstream of Parks Highway bridge—adopted 1990)

Optimal Escapement Goal: 7,500 coho salmon (upstream of Parks Highway bridge—adopted 1990)

In-River Goal: None

Action Point:

Greater than 7,500 coho salmon	Recreational bag limits may be raised from 3 to 5 coho salmon, 16 inches or more in length, downstream of the weir and within a one-quarter-mile radius of the confluence of the Little Susitna River and Nancy Lake Creek

Escapement Enumeration Methods: Visual counts have been made at a weir since 1986. Several visual counts were made during fixed-wing aerial surveys in 1978, 1981–1987, and 1991.

History of Goal: This system has a mix of wild and hatchery stocks. Substantial numbers of hatchery-produced adult coho salmon have been entering this system since 1988. The biological escapement goal for this system was set at a level similar to the average wild coho salmon escapement (7,195) for 9 years: 1978, 1981–1983, 1985, and 1987–1990. No surveys were made in 1979 and 1980, the 1984 estimate was excluded from the average since escapement was unusually large, and the 1986 survey was incomplete and made under poor conditions. The *Little Susitna River Coho Salmon Management Plan* (5 AAC 61.060), adopted by the Board of Fisheries in 1990, established an optimal escapement goal for wild coho salmon equal to the biological escapement goal set by the department.

Appendix H.6
Ship Creek Coho Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Ship Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 200 coho salmon (adopted 1994)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys and at a water-control structure located in the Chugach Electric Association water-intake dam since 1969.

History of Goal: This system has a mix of wild and hatchery stocks. Escapement counts between 1969 and 1992 have ranged from 55 to 2,234 coho salmon. The biological escapement goal represents about 50% of the average count (424 coho salmon) conducted over 13 years, not including coho salmon removed for hatchery broodstock: 1969–1975, 1977, 1978, 1980, and 1990–1992. No surveys were conducted in 1976, 1979, or 1981–1989.

Appendix H.7
Wasilla Creek Coho Salmon

Regulatory Area: Cook Inlet - Susitna-West Cook Inlet Area

Stock Unit: Wasilla Creek

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 300 coho salmon (adopted 1994)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1970.

History of Goal: Foot survey escapement counts of Wasilla Creek coho salmon have been made since 1970. Foot surveys of Spring Creek, on the Matanuska River flats, were added to the program in 1979, and foot surveys of Spring Creek, adjacent to Wasilla Creek, were added in 1986. Escapement counts since 1970 have ranged from 14 to 966 coho salmon. The biological escapement goal represents the sum of the average foot survey counts for (1) Wasilla Creek (170 coho salmon) conducted over 17 years—1970–1976, 1978, 1979, 1981–1985, 1987, 1990, and 1991; (2) Spring Creek (Matanuska River flats–50 coho salmon) conducted over 15 years—1977, 1978, and 1980–1992; and (3) Spring Creek (Wasilla–80 coho salmon) conducted over 8 years—1985–1992. All counts represent an index, rather than an estimate, of total escapement into the system.

Appendix I.1
Kulukak River Coho Salmon

Regulatory Area: Bristol Bay - Togiak District

Stock Unit: Kulukak River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 15,000 coho salmon (adopted 1986)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1980.

History of Goal: The earliest documentation available for Kulukak River coho salmon was a 1984 memorandum from Michael Nelson, the Senior Bristol Bay Area Management Biologist at the time. Mr. Nelson suggested a provisional goal of 15,000 coho salmon (range: 10,000 to 20,000) based on an assumed return-per-spawner value of 2 and the desire to maintain a run of about 30,000 coho salmon. Reevaluations of the provisional goal in 1986 and 1991, based on average return-per-spawner data, indicated that this goal was reasonable and should be maintained.

Appendix I.2
Nushagak River Coho Salmon

Regulatory Area: Bristol Bay - Nushagak District

Stock Unit: Nushagak River (includes Mulchatna and Nuyakuk Rivers)

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 90,000 coho salmon (range: 50,000 to 100,000; adopted 1992)

Optimal Escapement Goal: None

In-River Goal: None (an interim goal of 100,000 coho salmon used for the 1993 season is pending Alaska Board of Fisheries adoption of a management plan for this stock)

Action Points: None

Escapement Enumeration Methods: Counts were made since 1982 with single-beam hydroacoustic equipment, placed on both banks of the Nushagak River below Portage Creek, in conjunction with drift gillnet test fishing. Visual counts were made during fixed-wing aerial surveys from 1973 through 1978.

History of Goal: Until the mid 1980s, Nushagak District coho salmon were only lightly exploited; therefore, little effort was expended in determining spawning needs for maximum sustained yield. By 1984, increasing runs and fishing effort prompted the department to set an escapement goal of 150,000 with a range of 100,000–200,000. This goal was supposed to maintain future annual runs within a range of 200,000–400,000 coho salmon, assuming production averaged 2 returning adults per spawner. Unfortunately, little information was available on coho salmon production within the system, and it now appears the large runs observed during 1980-1984 were not sustainable. Commercial fishing had to be drastically curtailed to achieve the goal of 150,000. Some people within the fishing industry believe this decline was caused by an interception of Nushagak River coho salmon in fisheries outside Bristol Bay. Reevaluation of available data in 1992 by the Sport and Commercial Fisheries Divisions, based on results of Ricker models and average return-per-spawner values, indicated the biological escapement goal should be much less than 150,000. While the escapement producing maximum sustained yield was difficult to determine, a goal of 90,000 was selected as a biological escapement goal that would at least produce high sustained yields. Additionally, an interim in-river goal of 100,000 coho salmon was used during the 1993 fishing season to ensure subsistence and recreational fisheries needs above the counting site would be met.

Appendix I.3
Togiak River Coho Salmon

Regulatory Area: Bristol Bay - Togiak District

Stock Unit: Togiak River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 50,000 coho salmon (adopted 1986)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1980.

History of Goal: The earliest documentation available for Togiak River coho salmon was a 1984 memorandum from Michael Nelson, the Senior Bristol Bay Area Management Biologist at the time. Mr. Nelson suggested a provisional goal of 50,000 coho salmon (range: 25,000 to 75,000) based on an assumed return-per-spawner value of 2 and the desire to maintain a run of about 100,000 coho salmon. Reevaluations of the provisional goal in 1986 and 1991, based on average return-per-spawner data, indicated the biological escapement goal should be 50,000 coho salmon.

Appendix J.1
Coghill District Pink Salmon

Regulatory Area: Prince William Sound - Coghill District

Stock Unit: Coghill District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine and Drift Gillnet

Biological Escapement Goals:

Odd Years: 178,000 pink salmon (range: 160,000 to 196,000; adopted 1990)
Even Years: 143,000 pink salmon (range: 129,000 to 158,000; adopted 1990)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 13 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 13 systems surveyed represent 20%–25% of all anadromous streams in the district and comprise 75%–85% of the district's total pink salmon escapement:

Triple Creek	Avery River	Hobo Creek
Hummer Creek	Swanson Creek	Village Creek
Coghill River	Mill Creek	Pirate Creek
Golden Lagoon	Harrison Creek	Old Creek
Meacham Creek		

An escapement goal, represented as a range (262,500–315,000 pink salmon), was first reported by Pirtle (1978) for the 1977 season. This goal was reported as a combined goal for the Coghill and Northwestern Districts and may have been in place since at least 1960. This same goal remained unchanged until 1990 when separate odd- and even-year goals were established for the 2 districts as they are currently described. Goals were calculated as the mean of all available even- or odd-year aerial survey index counts from 1966 through 1988 or 1989. Range limits were set that encompassed values within plus or minus 10% of the mean. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimates and spawning goals will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix J.2
Eastern District Pink Salmon

Regulatory Area: Prince William Sound - Eastern District

Stock Unit: Eastern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goals:

Odd Years: 422,000 pink salmon (range: 380,000 to 465,000; adopted 1990)
Even Years: 474,000 pink salmon (range: 427,000 to 521,000; adopted 1990)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 52 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 52 systems surveyed represent 20%–25% of all anadromous streams in this district and comprise 75%–85% of the district's total pink salmon escapement:

Hartney Creek	Pass Creek	Irish Creek	Black Creek
Gorge Creek	Eccles Creek	Plateau Creek	Whalen Creek
Turner Creek	Sawmill Creek	Fleming Creek	Comfort Creek
Keta Creek	Millard Creek	Lowe River	Humpy Creek
Beartrap Creek	Sunny River	Duck River	Siwash Creek
Twin Lakes Creek	Cataract Creek	Short Creek	Indian Creek
Crooked Creek	Spring Creek	Olsen Creek	Fish Creek
Donaldson Creek	Mineral Flats	Rogue Creek	Control Creek
Shale Creek	Levshakoff Creek	Twin Falls Creek	Chase Creek
Carlsen Creek	Kirkwood Creek	No Name Creek	Stellar Creek
Koppen Creek	St. Matthews Creek	Rock Creek	Gregorieff Creek
Sheep River	Two Moon Creek	Lagoon Creek	Naomoff River
Allen Creek	Tundra Creek	Gladhough Creek	Vlasoff Creek

An escapement goal, represented as a range (403,700–484,500 pink salmon), was first reported by Pirtle (1978) for the 1977 season. This same goal may have been in place since at least 1960 and remained essentially unchanged until 1990 when separate odd- and even-year goals were established. Goals were calculated as the mean of all available even- or odd-year aerial survey index counts from 1966 through 1988 or 1989. Range limits were set that encompassed values within plus or minus 10% of the mean. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days.

Escapement estimates and spawning goals will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix J.3
Eshamy District Pink Salmon

Regulatory Area: Prince William Sound - Eshamy

Stock Unit: Eshamy District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift and Set Gillnet

Biological Escapement Goals:

Odd Years: 5,700 pink salmon (range: 5,100 to 6,200; adopted 1990)
Even Years: 8,200 pink salmon (range: 7,000 to 9,000; adopted 1990)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 5 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 5 systems surveyed represent 20%–25% of all anadromous streams in the district and comprise 75%–85% of the district's total pink salmon escapement:

Loomis Creek	Gumboot Creek	Solf Creek
Elishansky Creek	Eshamy River	

An escapement goal, represented as a range (112,500–135,000 pink salmon), was first reported by Pirtle (1978) for the 1977 season. This goal was reported as a combined goal for the Eshamy and Southwestern Districts and may have been in place since at least 1960. This same goal remained unchanged until 1990 when separate odd- and even-year goals were established for the 2 districts as they are currently described. Goals were calculated as the mean of all available even- or odd-year aerial survey index counts from 1966 through 1988 or 1989. Range limits were set that encompassed values within plus or minus 10% of the mean. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimates and spawning goals will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix J.4
Montague District Pink Salmon

Regulatory Area: Prince William Sound - Montague District

Stock Unit: Montague District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goals:

Odd Years: 162,000 pink salmon (range: 146,000 to 179,000; adopted 1990)
Even Years: 70,000 pink salmon (range: 63,000 to 77,000; adopted 1990)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 33 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 33 systems surveyed represent 20%–25% of all anadromous streams in the district and comprise 75%–85% of the district's total pink salmon escapement:

Montague Island #1 (Stream 717)	Point Creek	Kelez Creek	Stockdale Creek
Montague Island #2 (Stream 718)	Chalmers River	Stockdale Bay	Shad Creek
Montague Island #3 (Stream 719)	Rosswog Creek	Russell Creek	Cabin Creek
Montague Island #4 (Stream 722)	Swamp Creek	Gilmour Creek	Udall Creek
Montague Island #5 (Stream 724)	McKernan Creek	Carr Creek	Clam Beach Creek
Montague Island #6 (Stream 725)	MacLeod Creek	Wilby Creek	Dry Creek
Pautze Creek	Hanning Creek	Wild Creek	Green Creek
Rocky Bay Head	Quadra Creek	Montague Creek	Schuman Creek
Rocky Creek			

An escapement goal, represented as a range (106,200–127,500 pink salmon), was first reported by Pirtle (1978) for the 1977 season. This same goal may have been in place since at least 1960 and remained essentially unchanged until 1990 when separate odd- and even-year goals were established. Goals were calculated as the mean of all available even- or odd-year aerial survey index counts from 1966 through 1988 or 1989. Range limits were set that encompassed values within plus or minus 10% of the mean. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimates and spawning goals will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix J.5
Northern District Pink Salmon

Regulatory Area: Prince William Sound - Northern District

Stock Unit: Northern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goals:

Odd Years: 128,000 pink salmon (range: 115,000 to 141,000; adopted 1990)
Even Years: 213,000 pink salmon (range: 192,000 to 235,000; adopted 1990)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 30 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 30 systems surveyed represent 20%–25% of all anadromous streams in the district and comprise 75%–85% of the district's total pink salmon escapement:

Heather Bay	Vanishing Creek	Cedar Creek	Williams Creek
Siwash River	Granite Cove	Spring Creek	Delta Creek
Waterfall Creek	Unakwik Creek	Useless Creek	Billy's Creek
Surplus Creek	Canyon Creek	Schoppe Creek	Elf Creek
Eickelberg Creek	Wells River	Good Creek	Black Bear Creek
Bench Mark Creek	Backyard Creek	12565 Creek	Bad Creek
Dead Creek	Long Creek	Granite Creek	Complex Creek
Derickson Creek	Comeback Creek		

An escapement goal, represented as a range (140,000–168,000 pink salmon), was first reported by Pirtle (1978) for the 1977 season. This same goal may have been in place since at least 1960 and remained essentially unchanged until 1990 when separate odd- and even-year goals were established. Goals were calculated as the mean of all available even- or odd-year aerial survey index counts from 1966 through 1988 or 1989. Range limits were set that encompassed values within plus or minus 10% of the mean. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimates and spawning goals will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix J.6
Northwestern District Pink Salmon

Regulatory Area: Prince William Sound - Northwestern

Stock Unit: Northwestern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goals:

Odd Years: 83,000 pink salmon (range: 75,000 to 92,000; adopted 1990)
Even Years: 135,000 pink salmon (range: 122,000 to 149,000; adopted 1990)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 17 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 17 systems surveyed represent 20%–25% of all anadromous streams in the district and comprise 75%–85% of the district's total pink salmon escapement:

Logging Camp Creek	Paulson Creek	Narrows Creek	East Finger Creek
McClure Creek	Tebenkoff Creek	Parks Creek	Shrode Creek
West Finger Creek	Blackstone Creek	Cochran Creek	Culross Creek
Most Creek	Halferty Creek	Wickett Creek	Mink Creek
Chimevisky Lagoon			

An escapement goal, represented as a range (262,500–315,000 pink salmon), was first reported by Pirtle (1978) for the 1977 season. This goal was reported as a combined goal for the Coghill and Northwestern Districts and has been in place since at least 1960. This same goal remained unchanged until 1990 when separate odd- and even-year goals were established for the 2 districts as they are currently described. Goals were calculated as the mean of all available even- or odd-year aerial survey index counts from 1966 through 1988 or 1989. Range limits were set that encompassed values within plus or minus 10% of the mean. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimates and spawning goals will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix J.7
Southeastern District Pink Salmon

Regulatory Area: Prince William Sound - Southeastern District

Stock Unit: Southeastern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goals:

Odd Years: 333,000 pink salmon (range: 300,000 to 366,000; adopted 1990)
Even Years: 239,000 pink salmon (range: 215,000 to 263,000; adopted 1990)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 31 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 31 systems surveyed represent 20%–25% of all anadromous streams in the district and comprise 75%–85% of the district's total pink salmon escapement:

Port Etches-South Shore	Constantine Creek	King Creek	Widgeon Creek
Orca Creek	Clamdiggers Creek	Dog Salmon Creek	Deer Creek
Double Creek	Goose Creek	Zillesenoff Creek	Beaver Creek
Juania Creek	Bates Creek	Makaka Creek	West Lagoon Creek
Garden Creek	Hardy Creek	Hawkins Bay	Etches Creek
East Lagoon Creek	Scott Creek	Rollins Creek	Nuchek Creek
Cook Creek	North Lagoon Creek	Dan's Creek	Canoe Creek
Bernard Creek	Captain Creek	Brown Bear Creek	

An escapement goal, represented as a range (225,000–270,000 pink salmon), was first reported by Pirtle (1978) for the 1977 season. This same goal may have been in place since at least 1960 and remained essentially unchanged until 1990 when separate odd- and even-year goals were established. Goals were calculated as the mean of all available even- or odd-year aerial survey index counts from 1966 through 1988 or 1989. Range limits were set that encompassed values within plus or minus 10% of the mean. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimates and spawning goals will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix J.8
Southwestern District Pink Salmon

Regulatory Area: Prince William Sound - Southwestern

Stock Unit: Southwestern District

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goals:

Odd Years: 116,000 pink salmon (range: 105,000 to 128,000; adopted 1990)
Even Years: 144,000 pink salmon (range: 130,000 to 159,000; adopted 1990)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of 27 selected index streams have been made during fixed-wing aerial surveys since 1960.

History of Goal: The 27 systems surveyed represent 20%–25% of all anadromous streams in the district and comprise 75%–85% of the district's total pink salmon escapement:

Paddy Creek	Jackpot Bay #1	Claw Creek	Halverson Creek
Horseshoe Creek	Nacktan Creek	Jackpot Bay #2	Pablo Creek
Bjorne Creek	Hayden Creek	Ewan Creek	Jackson Creek
Whale Bay #1	O'Brien Creek	Snug Harbor	Erb Creek
Totemoff Creek	Whale Creek	Montgomery Creek	Jackpot River
Brizgaloff Creek	Hogg Creek	Latouche Island	Kompkoff River
Bainbridge Creek	Johnson Creek	Falls Creek	

An escapement goal, represented as a range (112,500–135,000 pink salmon), was first reported by Pirtle (1978) for the 1977 season. This goal was reported as a combined goal for the Eshamy and Southwestern Districts and may have been in place since at least 1960. This same goal remained unchanged until 1990 when separate odd- and even-year goals were established for the 2 districts as they are currently described. Goals were calculated as the mean of all available even- or odd-year aerial survey index counts from 1966 through 1988 or 1989. Range limits were set that encompassed values within plus or minus 10% of the mean. Total escapements into individual systems are estimated using a trapezoidal approximation of the area under weekly aerial survey observation curves that have been corrected for a stream life of 17.5 days. Escapement estimates and spawning goals will be re-evaluated using information obtained from as yet unpublished *Exxon Valdez* oil spill studies; these studies examine surveyor bias and stream life constants for various systems within the aerial survey index program.

Appendix K.1
Aialik Lake Creek Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Aialik Lake Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 pink salmon (adopted 1986)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1962.

History of Goal: This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. The goal was first established in 1986 and has not been revised since that time. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.2
Airport Creek Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Airport Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 300 to 400 pink salmon (adopted 1976)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial and ground surveys since the 1960s.

History of Goal: This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. The goal was first established in 1976 and has not been revised since that time. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.3
Amakdedori Creek Pink Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Amakdedori Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1960.

History of Goal: Methods and rationales for setting this goal are not documented, but the goal is considered to be a biological escapement goal set at a level thought to produce yields at close to maximum sustainable levels. The goal was first established in 1982 and has not been revised since that time. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.4
Barabara Creek Pink Salmon

Regulatory Area: Cook Inlet - Southern District

Stock Unit: Barabara Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 18,000 to 24,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Methods and rationales for setting this goal are not documented, but the goal is considered to be a biological escapement goal set at a level thought to produce yields at close to maximum sustainable levels. The goal was first established in 1982 and has not been revised since that time. The upper end of the range is used as a management target only after upstream spawning is observed. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.5
Bear Creek Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Bear Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made during fixed-wing aerial and ground surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1976	4 to 5	1979	unknown	1982	5	1985	5	1988	5	1991	5
1977	unknown	1980	unknown	1983	5	1986	5	1989	5	1992	5
1978	unknown	1981	unknown	1984	5	1987	5	1990	5	1993	5

This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. A goal was first established in 1976 and does not appear to have been revised since that time. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Pink salmon production from this system may have been reduced by pollution (manure and feathers) from a chicken farm operated between 1982 and 1987, as well as more recent housing construction along the creek.

Appendix K.6
Big Kamishak River Pink Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Big Kamishak River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 20,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1962.

History of Goal: Methods and rationales for setting this goal are not documented, but the goal is considered to be a biological escapement goal set at a level thought to produce yields at close to maximum sustainable levels. The goal was first established in 1982 and has not been revised since that time. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Turbid water conditions often make it difficult to obtain accurate and comprehensive escapement estimates.

Appendix K.7
Brown's Peak Creek Pink Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Brown's Peak Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 to 20,000 pink salmon (adopted 1989)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1962.

History of Goal: Published goals (in thousands of pink salmon):

1982	10	1985	10	1988	10	1991	10 to 20
1983	10	1986	10	1989	10 to 20	1992	10 to 20
1984	10	1987	10	1990	10 to 20	1993	10 to 20

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. Ricker curve analyses, based on brood year data up to 1986, produce a biological escapement goal estimate of 8,400 pink salmon for all years and 7,700 pink salmon for peak years; both are below the lower range of the current goal. A Ricker curve could not be fit to off-cycle years. No odd- or even-year cycle of dominant escapements and returns are evident for the system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs while off-cycle years had small runs. Errors in estimated stock proportions in Ursus-Rocky Cove area commercial catches probably influenced Ricker curve analysis results.

Appendix K.8
Bruin River Pink Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Bruin River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 25,000 to 50,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1975	25	1979	unknown	1983	25 to 50	1987	25 to 50	1991	25 to 50
1976	unknown	1980	unknown	1984	25 to 50	1988	25 to 50	1992	25 to 50
1977	unknown	1981	unknown	1985	25 to 50	1989	25 to 50	1993	25 to 50
1978	unknown	1982	25 to 50	1986	25 to 50	1990	25 to 50		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. Ricker curve analysis was greatly influenced by a 1986 escapement of 1,206,000 pink salmon (3 times greater than the next largest escapement of 403,800 pink salmon). If escapement and return data for this brood year were not used, Ricker curve analyses produced a biological escapement goal estimate of 47,100 pink salmon for all years, within the range of the current goal, and 15,800 pink salmon for off-cycle years, below the lower range of the current goal. A Ricker curve fit to peak years produced a biological escapement goal estimate less than any of the escapements used to build the model. If escapement and return data for this brood year were used, Ricker curve analyses produced a biological escapement goal estimate of 67,800 pink salmon for all years, above the upper range of the current goal, and 17,800 pink salmon for peak years. No odd- or even-year cycle of dominant escapements and returns were evident for this system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs, while off-cycle years had small runs. When spawning populations become greater than 50,000 pink salmon, spawners tend to move into upstream areas where eggs are killed by winter freezing.

Appendix K.9
China Poot Creek Pink Salmon

Regulatory Area: Cook Inlet - Southern District

Stock Unit: China Poot Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Methods and rationales for setting this goal are not documented, but the goal is considered to be a biological escapement goal set at a level thought to produce yields at close to maximum sustainable levels. The goal was first established in 1982 and has not been revised since that time. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.10
Clear Creek Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Clear Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 2,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since the 1960s.

History of Goal: Published goals (in thousands of pink salmon):

1976	1 to 2	1979	unknown	1982	2	1985	2	1988	2	1991	2
1977	unknown	1980	unknown	1983	2	1986	2	1989	2	1992	2
1978	unknown	1981	unknown	1984	2	1987	2	1990	2	1993	2

This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. The goal was first established in 1976 and has not been revised since that time. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.11
Desire Lake Creek Pink Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Desire Lake Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 to 20,000 pink salmon (adopted 1986)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1962.

History of Goal: This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. The goal was first established in 1986 and has not been revised since that time. The upper end of the range is used as a management target only after upstream spawning is observed. Ricker curve analysis of all years, using brood year data from 1980 to 1987, produced a biological escapement goal estimate of 12,100 pink salmon, within the range of the current goal. No odd- or even-year cycle of dominant escapements and returns are evident for this system. The small data set as well as errors in apportioning the commercial catch between Desire Lake and James Lagoon probably affected Ricker curve analysis. The commercial catch from McCarty Fiord (East Nuka Bay) is apportioned between these 2 systems based on the ratio of their escapements, but escapement data from both systems were not available prior to 1980.

Appendix K.12
Grouse Creek Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Grouse Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 1,000 to 2,000 pink salmon (adopted 1976)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made during fixed-wing aerial and ground surveys since the 1960s.

History of Goal: This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. The goal was first established in 1976 and has not been revised since that time. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.13
Humpy Cove Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Humpy Cove

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 2,000 pink salmon (adopted 1985)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1974.

History of Goal: Published goals (in thousands of pink salmon):

1976	0.5 to 1	1979	unknown	1982	1	1985	2	1988	2	1991	2
1977	unknown	1980	unknown	1983	1	1986	2	1989	2	1992	2
1978	unknown	1981	unknown	1984	1	1987	2	1990	2	1993	2

This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. A goal was first established in 1976; the present goal was established in 1985. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.14
Humpy Creek Pink Salmon

Regulatory Area: Cook Inlet - Southern District

Stock Unit: Humpy Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 25,000 to 50,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1970	22.5 to 30	1975	30	1980	25.5 to 30	1985	25 to 50	1990	25 to 50
1971	unknown	1976	unknown	1981	22.5 to 30	1986	25 to 50	1991	25 to 50
1972	unknown	1977	22.5 to 30	1982	25 to 50	1987	25 to 50	1992	25 to 50
1973	unknown	1978	unknown	1983	25 to 50	1988	25 to 50	1993	25 to 50
1974	unknown	1979	22.5 to 30	1984	25 to 50	1989	25 to 50		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. The 1970 goal was based on estimates of available spawning area, assuming an optimal range of 1.5 to 2.0 spawners per square meter. Ricker curve analysis, using brood year data up to and including 1986 and based on escapements less than 40,000, produced a biological escapement goal estimate of 18,500 pink salmon, slightly less than the lower range of the current goal. Ricker curve analysis of all available data produced a biological escapement goal estimate of 51,900 pink salmon, similar to the upper range of the current goal. Escapements above 40,000 pink salmon generally result in large numbers of spawning pink salmon in upstream areas above the right fork. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.15
Island Creek Pink Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Island Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 12,000 to 18,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1970	18 to 24	1975	24	1980	10 to 15	1985	12 to 18	1990	12 to 18
1971	unknown	1976	unknown	1981	10 to 15	1986	12 to 18	1991	12 to 18
1972	unknown	1977	10 to 15	1982	12 to 18	1987	12 to 18	1992	12 to 18
1973	unknown	1978	unknown	1983	12 to 18	1988	12 to 18	1993	12 to 18
1974	unknown	1979	10 to 15	1984	12 to 18	1989	12 to 18		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. The 1970 goal was based on estimates of available spawning area, assuming an optimal range of 1.5 to 2.0 spawners per square meter. Ricker curve analysis, using brood year data up to 1986, produced a biological escapement goal estimate of 11,000 pink salmon, which was similar to the lower end of the range of the current goal. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Between 1960 and 1970, there was a clearly discernable pattern in which peak-year (even-year) escapements were an order of magnitude greater than odd-year escapements. However, between 1971 and 1980, all escapements were small (below 2,000 pink salmon), and all returns, except those in 1979 (escapement: 600; return: 242,729) and 1980 (escapement: 2,200; return: 33,911), were small. Between 1981 and 1986, all escapements were large (greater than 15,000 pink salmon) and all returns, except those from 1985 (escapement: 27,900; return: 165) and 1986 (escapement: 16,600; return: 9,413) were fairly large. Errors in estimating stock proportions in commercial catches may account for much of the variability in observed production from any given escapement.

Appendix K.16
James Lagoon Pink Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: James Lagoon

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 to 10,000 pink salmon (adopted 1986)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made from foot surveys since 1980.

History of Goal: This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. The goal was first established in 1986 and has not been revised since that time. The upper end of the range is used as a management target only after upstream spawning is observed. Ricker curve analysis of all years, using brood year data up to 1986, produced a biological escapement goal estimate of 3,100 pink salmon, which was below the range of the current goal. No odd- or even-year cycle of dominant escapements and returns are evident for this system. The small data set, as well as errors in estimating stock proportions in commercial catches between Desire Lake and James Lagoon, probably affected Ricker curve analysis. The commercial catch from McCarty Fiord (East Nuka Bay) is divided between these 2 systems based on the ratio of their escapements, but escapement data from both systems are not available prior to 1980.

Appendix K.17
Little Kamishak River Pink Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Little Kamishak River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 20,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1962.

History of Goal: Methods and rationales for setting this goal are not documented, but the goal is considered to be a biological escapement goal set at a level thought to produce yields at close to maximum sustainable levels. The goal was first established in 1982 and has not been revised since that time.

Appendix K.18
Mayor Creek Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Mayor Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 2,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since the 1960s.

History of Goal: Published goals (in thousands of pink salmon):

1976	1 to 2	1979	unknown	1982	2	1985	2	1988	2	1991	2
1977	unknown	1980	unknown	1983	2	1986	2	1989	2	1992	2
1978	unknown	1981	unknown	1984	2	1987	2	1990	2	1993	2

This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. The goal was first established in 1976 and has not been revised since that time. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.19
Port Chatham Pink Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Port Chatham

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 to 15,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Methods and rationales for setting this goal are not documented, but the goal is considered to be a biological escapement goal set at a level thought to produce yields at close to maximum sustainable levels. The goal was first established in 1982 and has not been revised since that time. The upper end of the range is used as a management target only after upstream spawning is observed. Ricker curve analysis, using brood year data up to and including 1986, produced biological escapement goal estimates of 13,500 pink salmon for peak years, which were within the range of the current goal. A Ricker curve could not be fit to either off-cycle years or all years. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs, while off-cycle years had small runs.

Appendix K.20
Port Dick Creek Pink Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Port Dick Creek (Head End)

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 20,000 to 100,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon) are as follows:

1970	22.5 to 30	1975	30	1980	22.5 to 30	1985	20 to 100	1990	20 to 100
1971	unknown	1976	unknown	1981	22.5 to 30	1986	20 to 100	1991	20 to 100
1972	unknown	1977	22 to 30	1982	20 to 100	1987	20 to 100	1992	20 to 100
1973	unknown	1978	unknown	1983	20 to 100	1988	20 to 100	1993	20 to 100
1974	unknown	1979	22.5 to 30	1984	20 to 100	1989	20 to 100		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. The 1970 goal was based on estimates of available spawning area, assuming an optimal range of 1.5 to 2.0 spawners per square meter. Ricker curve analysis, using brood year data up to 1986, produced a biological escapement goal estimate of 112,700 pink salmon for peak years, similar to the upper end of the range of the current goal, and 20,400 pink salmon for off-cycle years, similar to the lower end of the range of the current goal. A Ricker curve could not be fit to all years. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs, while off-cycle years had small runs.

Appendix K.21
Port Graham River Pink Salmon

Regulatory Area: Cook Inlet - Southern District

Stock Unit: Port Graham River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 20,000 to 40,000 pink salmon (adopted 1977)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1970	45 to 60	1975	60	1980	20 to 40	1985	20 to 30	1990	20 to 40
1971	unknown	1976	unknown	1981	20 to 40	1986	20 to 40	1991	20 to 40
1972	unknown	1977	20 to 40	1982	20 to 40	1987	20 to 40	1992	20 to 40
1973	unknown	1978	unknown	1983	20 to 40	1988	20 to 40	1993	20 to 40
1974	unknown	1979	20 to 40	1984	20 to 40	1989	20 to 40		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. The 1970 goal was based on estimates of available spawning area, assuming an optimal range of 1.5 to 2.0 spawners per square meter. Ricker curve analysis, using brood year data up to and including 1986, produced biological escapement goal estimates of 16,800 pink salmon for peak years and 13,900 pink salmon for all years, all of which were less than the lower end of the range of the current goal. A Ricker curve could not be fit to off-cycle-year data. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs, while off-cycle years had small runs. This system has had a history of downward revisions of its escapement goal. The original goal of 45,000 to 60,000 pink salmon was set to allow for extensive upstream spawning. However, this goal was lowered in 1977 as deep pools formed in upstream areas formerly used by spawning pink salmon. Stream channels are still in transition, and spawning areas continue to be lost.

Appendix K.22
Rocky River Pink Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Rocky River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 50,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1970	37.5 to 50	1975	50	1980	37.5 to 50	1985	50	1990	25 to 50
1971	unknown	1976	unknown	1981	37.5 to 50	1986	50	1991	25 to 50
1972	unknown	1977	35 to 50	1982	50	1987	50	1992	25 to 50
1973	unknown	1978	unknown	1983	50	1988	50	1993	25 to 50
1974	unknown	1979	37.5 to 50	1984	50	1989	50		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The 1970 goal was based on estimates of available spawning area, assuming an optimal range of 1.5 to 2.0 spawners per square meter. Ricker curve analysis, using brood year data from 1967 to 1986, produced a biological escapement goal estimate of 11,400 pink salmon for all years, 32,000 pink salmon for peak years, and 3,300 pink salmon for off-cycle years, all of which were well below the lower range of the current goal. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs, while off-cycle years had small runs. Upstream spawning areas have been reduced, due to flooding, since logging began in this watershed in 1965. The main stem of this river is no longer used by spawning pink salmon, and most spawning now occurs in the intertidal zone. Unless upstream spawning areas can be brought back into production, the current goal appears to be too large and needs to be re-evaluated.

Appendix K.23
Salmon Creek Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Salmon Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 pink salmon (adopted 1981)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1976.

History of Goal: Published goals (in thousands of pink salmon):

1976	5 to 10	1979	unknown	1982	10	1985	10	1988	10	1991	10
1977	unknown	1980	unknown	1983	10	1986	10	1989	10	1992	10
1978	unknown	1981	10	1984	10	1987	10	1990	10	1993	10

This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. A goal was first established in 1976; the present goal first appeared in reports in 1981. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Pink salmon production from this system may have been reduced by recent housing construction along the creek.

Appendix K.24
Seldovia Creek Pink Salmon

Regulatory Area: Cook Inlet - Southern District

Stock Unit: Seldovia Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 25,000 to 35,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1970	18 to 24	1975	24	1980	24 to 30	1985	25 to 35	1990	25 to 35
1971	unknown	1976	unknown	1981	24 to 30	1986	25 to 35	1991	25 to 35
1972	unknown	1977	18 to 24	1982	25 to 35	1987	25 to 35	1992	25 to 35
1973	unknown	1978	unknown	1983	25 to 35	1988	25 to 35	1993	25 to 35
1974	unknown	1979	24 to 30	1984	25 to 35	1989	25 to 35		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. The 1970 goal was based on estimates of available spawning area, assuming an optimal range of 1.5 to 2.0 spawners per square meter. Ricker curve analysis, using brood year data up to and including 1986, produced biological escapement goal estimates of 26,500 pink salmon for peak years, 29,700 pink salmon for off-cycle years, and 33,600 pink salmon for all years, all of which were within the range of the current goal. However, intertidal spawning areas have been reduced over the last 8 years due to shifts in the river channel, so the biological escapement goal will need to be re-evaluated. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs, while off-cycle years had small runs.

Appendix K.25
South Nuka Island Creek Pink Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: South Nuka Island Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made during fixed-wing aerial and ground surveys since 1960.

History of Goal: Methods and rationales for setting this goal are not documented, but the goal is considered to be a biological escapement goal set at a level thought to produce yields at close to maximum sustainable levels. The goal was first established in 1982 and has not been revised since that time. Ricker curves, using brood year data up to and including 1986, could not be fit to the data. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.26
Sunday Creek Pink Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Sunday Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 to 20,000 pink salmon (adopted 1989)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1975	30	1979	unknown	1983	10	1987	10	1991	10 to 20
1976	unknown	1980	unknown	1984	10	1988	10	1992	10 to 20
1977	unknown	1981	unknown	1985	10	1989	10 to 20	1993	10 to 20
1978	unknown	1982	10	1986	10	1990	10 to 20		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. Ricker curve analyses, based on brood year data up to 1986, produced a biological escapement goal estimate of 17,600 pink salmon for all years and 17,900 pink salmon for peak years, both within the range of the current goal. A Ricker curve fit to off-cycle years produced a biological escapement goal estimate of 1,600 pink salmon, much less than the lower range of the current goal. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs, while off-cycle years had small runs.

Appendix K.27
Thumb Cove Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Thumb Cove

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 4,000 pink salmon (adopted 1985)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1974.

History of Goal: Published goals (in thousands of pink salmon):

1976	0.5 to 1	1979	unknown	1982	1	1985	4	1988	4	1991	4
1977	unknown	1980	unknown	1983	1	1986	4	1989	4	1992	4
1978	unknown	1981	unknown	1984	1	1987	4	1990	4	1993	4

This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. A goal was first established in 1976; the present goal was established in 1982. No odd- or even-year cycle of dominant escapements and returns are evident for this system.

Appendix K.28
Tonsina Creek Pink Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Tonsina Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made during fixed-wing aerial and foot surveys since 1968.

History of Goal: Published goals (in thousands of pink salmon):

1976	2 to 3	1979	unknown	1982	5	1985	5	1988	5	1991	5
1977	unknown	1980	unknown	1983	5	1986	5	1989	5	1992	5
1978	unknown	1981	unknown	1984	5	1987	5	1990	5	1993	5

This goal was based on a subjective estimate of available spawning area and required spawning density; however, the estimate was not formally documented. The goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. A goal was first established in 1976; the present goal was established in 1982. No odd- or even-year cycle of dominant escapements and returns are evident for this system. This system was physically altered in 1987 when a storm pushed the sea berm into the creek and created a dam.

Appendix K.29
Tutka Creek Pink Salmon

Regulatory Area: Cook Inlet - Southern District

Stock Unit: Tutka Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 6,000 to 10,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1970	4.5 to 6	1975	7	1980	4.5 to 7	1985	6 to 10	1990	6 to 10
1971	unknown	1976	unknown	1981	4.5 to 7	1986	6 to 10	1991	6 to 10
1972	unknown	1977	4.5 to 7	1982	6 to 10	1987	6 to 10	1992	6 to 10
1973	unknown	1978	unknown	1983	6 to 10	1988	6 to 10	1993	6 to 10
1974	unknown	1979	4.5 to 7	1984	6 to 10	1989	6 to 10		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. The 1970 goal was based on estimates of available spawning area, assuming an optimal range of 1.5 to 2.0 spawners per square meter. No odd- or even-year cycle of dominant escapements and returns are evident for this system. A large hatchery facility was constructed in Tutka Lagoon in 1976 that now has a capacity to incubate 50 million pink salmon eggs. The mix of wild and hatchery stocks in Tutka Creek escapements in not known.

Appendix K.30
Windy Creek Left Pink Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Windy Creek Left

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 30,000 to 50,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1970	7.5 to 10	1976	unknown	1982	30 to 50	1988	30 to 50
1971	unknown	1977	7.5 to 10	1983	30 to 50	1989	30 to 50
1972	unknown	1978	unknown	1984	30 to 50	1990	30 to 50
1973	unknown	1979	7.5 to 10	1985	30 to 50	1991	30 to 50
1974	unknown	1980	7.5 to 10 or 25 to 35	1986	30 to 50	1992	30 to 50
1975	10	1981	7.5 to 10 or 25 to 35	1987	30 to 50	1993	30 to 50

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The upper end of the range is used as a management target only after upstream spawning is observed. The 1970 goal was based on estimates of available spawning area, assuming an optimal range of 1.5 to 2.0 spawners per square meter. Ricker curve analysis, using brood year data up to 1986, produced a biological escapement goal estimate of 38,200 pink salmon for all years and 30,400 pink salmon for peak years, both of which were within the range of the current goal. Ricker curve analysis using off-cycle years produced a biological escapement goal estimate of 2,000 pink salmon, well below the lower range of the current goal. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs, while off-cycle years had small runs. The increase of the goal in 1982, to account for availability of upstream spawning areas above the forks, may be too great and should be reexamined. However, errors in apportioning the commercial catch between Windy Creek Left and Right may have affected Ricker curve analysis. Combining data from both Windy Creek Left and Right resulted in a biological escapement goal estimate of 60,200 pink salmon, similar to the upper end of the combined existing range for Windy Creek Left and Right (60,000 pink salmon).

Appendix K.31
Windy Creek Right Pink Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Windy Creek Right

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 pink salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during foot surveys since 1960.

History of Goal: Published goals (in thousands of pink salmon):

1970	7.5 to 10	1975	10	1980	7.5 to 10	1985	10	1990	10
1971	unknown	1976	unknown	1981	7.5 to 10	1986	10	1991	10
1972	unknown	1977	7.5 to 10	1982	10	1987	10	1992	10
1973	unknown	1978	unknown	1983	10	1988	10	1993	10
1974	unknown	1979	7.5 to 10	1984	10	1989	10		

While methods and rationales for setting goals were not completely documented, most of the above goals are considered to be biological escapement goals set at a level thought to produce yields close to maximum sustainable levels. The 1970 goal was based on estimates of available spawning area, assuming an optimal range of 1.5 to 2.0 spawners per square meter. Ricker curve analysis, using brood year data up to 1986, produced a biological escapement goal estimate of 1,000 pink salmon for off-cycle years, well below the current goal. A Ricker curve could not be fit to either peak years or all years. No odd- or even-year cycle of dominant escapements and returns are evident for this system. Therefore, peak and off-cycle years were defined according to escapement size and resulting production: peak years had large runs, while off-cycle years had small runs. Considerable loss of upstream spawning areas has occurred due to logging activity in the watershed. However, errors in apportioning the commercial catch between Windy Creek Left and Right may have affected Ricker curve analysis. Combining data from both Windy Creek Left and Right resulted in a biological escapement goal estimate of 60,200 pink salmon, similar to the upper end of the combined existing range for Windy Creek Left and Right (60,000 pink salmon).

APPENDIX L. Pink Salmon Escapement Goal Summary for Bristol Bay

Nushagak River Pink Salmon

Regulatory Area: Bristol Bay - Nushagak District

Stock Unit: Nushagak River (includes Mulchatna and Nuyakuk Rivers)

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal:

Even Years: 900,000 pink salmon (range: 600,000 to 1,100,000; adopted 1992)
Odd Years: None (run is usually extremely small)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Counts have been made since 1980 with single-beam hydroacoustic equipment, placed on both sides of the Nushagak River below Portage Creek, in conjunction with drift gillnet test fishing. Visual counts were made from towers, placed on both banks of the Nuyakuk River draining the Tikchik Lakes, from 1960 to 1984. Visual counts for the Nuyakuk River below the tower site, as well as for the Nushagak and Mulchatna Rivers, were made during fixed-wing aerial surveys in 1958, 1962–1964, and 1974–1984.

History of Goal: Published goals (in millions of pink salmon):

1970	0.6 to 0.9	1976	0.6 to 1.0	1982	1.0	1988	1.0
1972	0.6	1978	0.8	1984	1.0	1990	1.0
1974	0.6 to 0.9	1980	1.0	1986	1.0	1992	0.9

Methods for setting the current goal have not been documented within a formal report, but were based on results of a non-linear-fitted Ricker model of adult production data using even years within the period 1958-1990 (B. Cross, Bristol Bay Research Project Leader, Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Anchorage, personal communications). The biological escapement goal has been set at a level thought to produce yields at maximum sustainable levels.

Appendix M.1
Bering River Delta Sockeye Salmon

Regulatory Area: Prince William Sound - Bering River District

Stock Unit: Bering River Delta

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift Gillnet

Biological Escapement Goal: 32,000 sockeye salmon (range: 26,000 to 38,000; adopted 1991)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts of various sites have been made during fixed-wing aerial surveys since 1970.

History of Goal: Four survey sites are thought to represent a large proportion of the total sockeye salmon escapement on the Bering River Delta:

Bering River/Lake	Shepard Creek	Stillwater Creek	Kushtaka Lake

The goal was calculated as the mean of combined peak counts for these 4 sites for 21 years: 1971–1991. Range limits were set as the lower and upper values of the 80% confidence interval about the mean. The goal represents an index, rather than a total estimate, of spawner abundance. Surveys are often hindered by wind and rain as well as by high and turbid water. While this goal should support a sustainable harvest, the goal that produces maximum sustained yield is not known.

Appendix M.2
Coghill Lake Sockeye Salmon

Regulatory Area: Prince William Sound - Coghill District

Stock Unit: Coghill Lake

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift Gillnet

Biological Escapement Goal: 25,000 sockeye salmon (range: 20,000 to 30,000; adopted 1992)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made at a weir since 1974. Visual counts were made from a tower and partial weir from 1960 to 1973. Visual counts were made during fixed-wing aerial and foot surveys in 1960, 1964, 1968, and 1971.

History of Goal: A minimum escapement goal of 25,000 sockeye salmon was adopted during the 1970s. This goal was increased to 40,000 in the early 1980s based on limited spawner-recruit information. A Ricker spawner-recruit analysis done for Coghill Lake sockeye salmon in 1984 indicated the initial goal of 25,000 sockeye salmon would result in better production. Limnology data collected in the late 1980s suggested the decline in this stock observed during the late 1980s might be due to large escapements that exceeded the rearing capacity of the system. Therefore, based on results of Ricker spawner-recruit analysis, observed stock declines, and limnology data, the escapement goal was returned to 25,000 sockeye salmon in 1992. Beginning in 1990, attempts to enhance the run have been made through a release of hatchery-reared smolts at the mouth of Coghill River.

Appendix M.3
Copper River Delta Sockeye Salmon

Regulatory Area: Prince William Sound - Copper River District

Stock Unit: Copper River Delta

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift Gillnet

Biological Escapement Goal: 90,000 sockeye salmon (range: 74,000 to 105,000; adopted 1991)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts of various sites have been made during fixed-wing aerial surveys since 1964. Visual counts at Tokun River/Lake were made at a weir during 1983-1985.

History of Goal: Seventeen survey sites are thought to represent a large proportion of the total sockeye salmon escapement on the Copper River Delta:

Eyak River/Lake	26/27 Mile Creek	Martin Lake	Hatchery Creek
39 Mile Creek	Pothole River/Lake	Power Creek	Goat Mountain Creek
Little Martin River/Lake	Ibek Creek	Pleasant Creek	Martin River Slough
McKinley Lake	Martin River	Tokun River/Lake	Salmon Creek
Ragged Point River/Lake			

For 2 sites, Eyak River/Lake and Martin Lake, 2 or more temporally distinct peaks of escapement occur during the season. These peak counts have been added to produce annual peak escapement counts for the 2 systems. The goal was calculated as the mean of combined peak counts for the 17 sites for 21 years: 1971–1991. Range limits were set as the lower and upper values of the 80% confidence interval about the mean. The goal represents an index, rather than a total estimate, of spawner abundance. Surveys are often hindered by wind and rain as well as by high and turbid water. While this goal should support a sustainable harvest, the goal that produces maximum sustained yield is not known.

Appendix M.4
Eshamy Lake Sockeye Salmon

Regulatory Area: Prince William Sound - Eshamy District

Stock Unit: Eshamy Lake

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift and Set Gillnet

Biological Escapement Goal: 35,000 sockeye salmon (range: 30,000 to 40,000; adopted 1986)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made from a weir since 1960.

History of Goal: Prior to 1986, the escapement goal for Eshamy Lake was 20,000–30,000 sockeye salmon. The goal was increased to 35,000 sockeye salmon based upon limnology and smolt enumeration data collected from 1982 to 1986 (L. Peltz, T. McDaniel, and J. McDaniel, Alaska Department of Fish and Game, Fisheries Rehabilitation, Enhancement and Development Division, Anchorage, personal communications). These data suggested that Eshamy Lake was capable of producing about 1,000,000 sockeye salmon smolts annually, and that about 40,000 spawners were needed to achieve this level of smolt production.

Appendix M.5
Upper Copper River Sockeye Salmon

Regulatory Area: Prince William Sound - Copper River District

Stock Unit: Upper Copper River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Drift Gillnet

Biological Escapement Goal: 300,000 sockeye salmon (adopted 1972)

Optimal Escapement Goal: 300,000 sockeye salmon (adopted 1980)

In-River Goal:

None for sockeye salmon
516,000 for all salmon species combined (adopted 1980)

Action Points:

None for sockeye salmon

More than 516,000 of all salmon species combined (adopted 1980)	Twenty-five percent of all salmon in excess of 516,000 are allocated to the personal use fishery, while the remainder are added to the spawning escapement, other user groups, and hatchery broodstock

Escapement Enumeration Methods: Counts have been made since 1978 with single-beam hydroacoustic equipment placed on both sides of the Copper River below Miles Lake. Visual counts have made during fixed-wing aerial surveys since the early 1960s.

History of Goal: Salmon population estimates conducted by state and federal investigators in 1966–1972 suggested that average escapement into this drainage was 300,000 sockeye salmon. Continued examination of escapement and return data suggested that this level of escapement would sustain large runs. A 300,000 sockeye salmon escapement goal was placed into regulation in 1980 when the Board of Fisheries adopted the *Copper River Personal Use Salmon Fishery Management Plan* (5 AAC 77.580). The personal use plan and the *Copper River Subsistence Salmon Fisheries Management Plan* (5 AAC 01.647) both set a total salmon escapement goal for the upper Copper River of 516,000 salmon to provide for spawning needs, hatchery uses, and in-river harvests. Neither plan distinguishes among salmon species for the purpose of setting overall subsistence or personal use harvest levels, although it was recognized that sockeye salmon dominated these harvests. While hatchery use and recreational harvest levels for sockeye salmon are provided in 5 AAC 77.580, they are not defined as maximum levels or quotas.

Appendix N.1
Aialik Lake Sockeye Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Aialik Lake

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 2,000 to 5,000 sockeye salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1961.

History of Goal: While methods and rationales for setting the goal were not documented, the above goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels.

Appendix N.2
Amakdedori Creek Sockeye Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Amakdedori Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 1,000 sockeye salmon (adopted 1984)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1960.

History of Goal: While methods and rationales for setting the goal were not documented, the above goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels.

Appendix N.3
Anderson Beach Sockeye Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Anderson Beach

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 2,000 sockeye salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made during fixed-wing aerial and foot surveys since 1961.

History of Goal: While methods and rationales for setting the goal were not documented, the above goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels.

Appendix N.4
Bear Lake Sockeye Salmon

Regulatory Area: Cook Inlet - Eastern District

Stock Unit: Bear Lake

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 1,000 sockeye salmon (adopted 1985)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made at a weir since 1960.

History of Goal: Published goals (in thousands of sockeye salmon):

1983	0.5	1985	1	1987	1	1989	1	1991	1	1993	1
1984	0.5	1986	1	1988	1	1990	1	1992	1		

The history of this sockeye salmon run is quite unique. Efforts were made by the department, until about the mid 1980s, to eradicate the sockeye salmon run to this system in order to maximize coho salmon production. The *Bear Lake Management Plan* (5 AAC 21.375), adopted in 1985, instructs the department to establish a sockeye salmon escapement goal and to manage fisheries to meet this goal. While a goal of 1,000 sockeye salmon has been listed in the department's annual management reports since 1985, management of this run has been strongly influenced by the operation of Trail Lakes Hatchery. The annual management plan for this facility specifies a minimum escapement goal of 5,000 sockeye salmon and a maximum escapement goal of 8,000 sockeye salmon for Bear Lake. These goals were established to ensure the availability of hatchery broodstock, rather than to produce a sustained yield from a naturally spawning run. The plan does not limit the number of sockeye salmon taken for broodstock, but, since all sockeye salmon arriving at the weir are allowed to migrate into the lake to mature before being collected for broodstock, some sockeye salmon escape to spawn naturally within the system. Currently, there is a debate on whether Bear Lake sockeye salmon should be treated as a wild stock, since Trail Lakes Hatchery has reared and released sockeye salmon smolts from Big River and other systems in and near the Bear Lake system.

Appendix N.5
Chenik Lake Sockeye Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Chenik Lake

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 sockeye salmon (adopted 1990)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made during fixed-wing aerial surveys since 1960. Visual counts have also been made at a weir that was operated intermittently until 1990.

History of Goal: Published goals (in thousands of sockeye salmon):

1982	10 to 20	1985	10 to 20	1988	10 to 20	1991	10
1983	10 to 20	1986	10 to 20	1989	10 to 20	1992	10
1984	10 to 20	1987	10 to 20	1990	10	1993	10

This system contains a mix of wild and hatchery stocks. Enhancement efforts began in 1978 after a long period of declining runs. While methods and rationales for setting goals were not well documented, the existing goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. A goal was first established in 1982 and was revised in 1990, based on examination of limnology data which suggested the lake could only support 10,000 sockeye salmon spawners.

Appendix N.6
Crescent River Sockeye Salmon

Regulatory Area: Cook Inlet - Central District

Stock Unit: Crescent River Drainage

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 50,000 to 100,000 sockeye salmon (adopted 1986)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Counts have been made since 1979 with single-beam hydroacoustic equipment set on both banks of the Crescent River at River Mile 1.5, in conjunction with fish wheels.

History of Goal: An initial escapement goal of 50,000 sockeye salmon was established in 1979 during comprehensive salmon development planning for Cook Inlet. It was set using a return-per-spawner value of 4 and the assumption this system could produce about 200,000 adult sockeye salmon. In 1986, the goal was changed from a point estimate to a range based on a review of spawner and return information.

Appendix N.7
Delight Lake Sockeye Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Delight Lake

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 sockeye salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1960.

History of Goal: While methods and rationales for setting this goal were not documented, the above goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels.

Appendix N.8
Desire Lake Sockeye Salmon

Regulatory Area: Cook Inlet - Outer District

Stock Unit: Desire Lake

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 sockeye salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1960.

History of Goal: While methods and rationales for setting this goal were not documented, the goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels.

Appendix N.9
English Bay River Sockeye Salmon

Regulatory Area: Cook Inlet - Southern District

Stock Unit: English Bay River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 10,000 to 20,000 sockeye salmon (adopted 1982)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1960.

History of Goal: While methods and rationales for setting this goal were not documented, the above goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. Declining runs to this system led to the initiation of enhancement efforts in 1990, when hatchery-reared fry were released into the system.

Appendix N.10
Fish Creek (Knik Arm) Sockeye Salmon

Regulatory Area: Cook Inlet - Northern District

Stock Unit: Fish Creek (Knik Arm)

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet and Personal Use

Biological Escapement Goal: 50,000 sockeye salmon (adopted 1982)

Optimal Escapement Goal: 50,000 sockeye salmon (adopted 1982)

In-River Goal: None

Action Points:

Greater than 50,000 sockeye salmon (adopted 1982)	A special commercial set gillnet fishery area in Knik Arm may be opened if sockeye salmon surplus to escapement cannot be harvested in traditional areas, and a personal use dip net fishery may be opened in Fish Creek

Escapement Enumeration Method: Visual counts have been made at a weir since 1966.

History of Goal: A review of the Fish Creek escapement goal was made in 1992 by the Alaska Department of Fish and Game (K. E. Tarbox, L. Peltz, and D. McBride, memo to K. Florey dated 13 May 1992). The review stated, "There are no data to suggest that 50,000 fish are excess to natural spawning requirements. Limited data on spawning area and euphotic volume suggest the 50,000 fish goal should be maintained. The spawner/return information suggests that good returns can be expected from spawning levels greater than 60,000 fish and reduced returns at spawning levels less than 30,000 fish." The *Fish Creek Sockeye Salmon Management Plan* (5 AAC 21.364) and the *Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan* (5 AAC 77.545) established an optimal goal as well as an action point for this system.

Appendix N.11
Kasilof River Sockeye Salmon

Regulatory Area: Cook Inlet - Central District

Stock Unit: Kasilof River Drainage

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 150,000 to 250,000 sockeye salmon (adopted 1986)

Optimal Escapement Goal: None

In-River Goal: None

Action Points:

Greater than 150,000 sockeye salmon (adopted 1986)	Personal use dip net fishery may be opened below counting site
Greater than 275,000 sockeye salmon (adopted 1986)	Kasilof River Salmon Special Harvest Area may be opened to commercial set and drift gillnet fishing

Escapement Enumeration Methods: Counts have been made since 1969 with single-beam hydroacoustic equipment, placed on both banks of Kasilof River at river mile 10, in conjunction with fish wheels.

History of Goal: The original escapement range goal of 75,000 to 150,000 sockeye salmon was based on the production of juvenile sockeye salmon in Tustumena Lake and catch rates resulting from various escapement levels. Investigators initially believed the Kasilof River system was spawning area limited, and based the escapement goal on an estimate of the spawning capacity of major tributaries. Enhancement efforts to increase production began in 1978 with a release of hatchery-reared fry into the system to supplement natural production. In 1986, the range was raised to 150,000 to 250,000 sockeye salmon based on spawner-return analyses. Sockeye salmon juvenile rearing studies in Tustumena Lake also provided supporting documentation for raising the range. Action points for achieving the escapement goal and dealing with surplus production were adopted by the Alaska Board of Fisheries under the *Kasilof River Sockeye Salmon Special Harvest Area Management Plan* (5 AAC 21.365) and the *Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan* (5 AAC 77.545).

Appendix N.12
Kenai River Sockeye Salmon

Regulatory Area: Cook Inlet - Central District

Stock Unit: Kenai River Drainage (sockeye salmon returning after 21 June, excluding Russian River late-run stock)

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 300,000 to 570,000 sockeye salmon (implied from in-river goal; excludes Russian River late-run biological goal [30,000])

Optimal Escapement Goal: 300,000 to 570,000 (implied from in-river goal; excludes Russian River late-run optimal goal [30,000])

In-River Goal: 400,000 to 700,000 sockeye salmon (explicitly provides 40,000 to 70,000 sockeye salmon for in-river sport fishery; implicitly provides for Russian River late-run sport harvest [average 30,000] and spawning escapement [30,000]; adopted 1987)

Action Points:

Less than 400,000 sockeye salmon (adopted 1989)	Sockeye salmon in-river sport fisheries closed; commercial fisheries restricted
400,000 sockeye salmon (adopted 1989)	Personal use dip net fishery may be opened below counting site
400,000 to 700,000 sockeye salmon (adopted 1989)	Sockeye salmon in-river sport fisheries managed for guideline harvest of 10% of projected escapement
Greater than 700,000 sockeye salmon (adopted 1989)	In-river sport fish daily bag and possession limit increased from 3 to 6 sockeye salmon; no restrictions on commercial fishery (even if chinook salmon escapement goal is not met)

Escapement Enumeration Methods: Counts have been made since 1969 with single-beam hydroacoustic equipment, placed on both sides of the Kenai River at river mile 17, in conjunction with fish wheels.

History of Goal: An escapement goal of 150,000 sockeye salmon was first established in 1968, based on estimated average contribution (30%) of Russian River sockeye salmon (counted at a weir) to total Kenai River escapement. In 1972, the goal was changed from a point value to a range of 150,000 to 250,000. The basis for this change was not documented, but it may have been due to revised estimates of Russian River contribution (20%). In 1978, the goal was increased to 350,000 to 500,000 sockeye salmon. This change appears to be based on (1) 1971–1973 escapements, which were thought to be responsible for the recovery in 1976–1978 of the formerly depressed run; (2) return-per-spawner data; and (3) estimated fry production. A continued trend of increasing returns and escapements prompted the

Alaska Board of Fisheries to establish the existing in-river goal and 2 action points under the *Kenai River Sockeye Salmon Management Plan* (5 AAC 21.360). An additional action point was established by the *Cook Inlet Personal Use Salmon Dip Net Fishery Management Plan* (5 AAC 77.545).

Appendix N.13
Mikfik Creek Sockeye Salmon

Regulatory Area: Cook Inlet - Kamishak District

Stock Unit: Mikfik Creek

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Purse Seine

Biological Escapement Goal: 5,000 to 7,000 sockeye salmon (adopted 1988)

Optimal Escapement Goal: None

In-River Goal: None

Action Points:

Less than 5,000 sockeye salmon (adopted 1988)	Commercial fishing may be allowed outside McNeil Lagoon
7,000 sockeye salmon (at least 500 in McNeil Lagoon; adopted 1988)	Commercial fishing may be allowed inside McNeil Lagoon

Escapement Enumeration Method: Visual counts have been made during fixed-wing aerial surveys since 1961.

History of Goal: Published goals (in thousands of sockeye salmon):

1982	5	1985	5	1988	5 to 7	1991	5 to 7
1983	5	1986	5	1989	5 to 7	1992	5 to 7
1984	5	1987	5	1990	5 to 7	1993	5 to 7

While methods and rationales for setting goals were not documented, the existing goal is considered to be a biological escapement goal set at a level thought to produce yields close to maximum sustainable levels. The goal of 5,000 to 7,000 sockeye salmon was established in 1988 under the *Mikfik Creek-McNeil Lagoon Management Plan* (Appendix A in Bucher et al. 1993), a cooperative plan developed by Commercial Fisheries (now Commercial Fisheries Management and Development) and Game (now Wildlife Conservation) Divisions and approved by the Commissioner in 1988. The goals of this plan are to provide adequate sockeye salmon escapement for spawning, furnish sockeye salmon for bear consumption throughout the duration of each run, and allow the commercial fishery to fully utilize surplus sockeye salmon.

Appendix N.14
Packers Creek Sockeye Salmon

Regulatory Area: Cook Inlet - Central District

Stock Unit: Packers Creek, Kalgin Island

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet.

Biological Escapement Goal: 15,000 to 25,000 sockeye salmon (adopted 1987)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made at a weir since 1980.

History of Goal: In 1987, ADF&G, in cooperation with the Cook Inlet Aquaculture Association (CIAA), reviewed escapements and resulting smolt production for Packers Creek sockeye salmon (Gary Kyle and Paul Ruesch, ADF&G, Soldotna, personal communications). The committee concluded that no increase in smolt production was evident for escapements greater than 15,000 sockeye salmon. However, since 4,000 adult sockeye salmon were needed for an enhancement program of lake fertilization and fry stocking being conducted in Packers Lake by ADF&G and CIAA, an escapement goal range of 15,000 to 25,000 sockeye salmon was established. No formal documentation exists for the 1987 decision. While no regulatory action points have been established for the system, the Trail Lakes Hatchery Management Plan specifies a reduced schedule for broodstock removal at escapements less than 15,000 sockeye salmon. Also, a cost recovery harvest for CIAA may be allowed in a special harvest area at escapements greater than 25,000 sockeye salmon.

Appendix N.15
Russian River Early-Run Sockeye Salmon

Regulatory Area: Cook Inlet - Kenai Peninsula Area

Stock Unit: Russian River Early Run (sockeye salmon returning prior to 22 June)

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 16,000 sockeye salmon (adopted 1990)

Optimal Escapement Goal: 16,000 sockeye salmon (adopted 1990)

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made at a weir since 1968. Visual counts were made from a tower in 1963–1967.

History of Goal: An escapement goal of 9,000 sockeye salmon was established by the department in the early 1970s and adopted by the Alaska Board of Fisheries in 1979 as part of the *Russian River Sockeye Salmon Management Plan* (5 AAC 21.361). This goal was based on estimates of available spawning area in upper Russian Creek, the only spawning area for early-run sockeye salmon known at that time. Studies in the late 1980s indicated that more spawning area was available, and evaluation of the 1969–1984 brood year data indicated that, on average, 5 returning adults were produced by each spawner. This new information suggested the escapement goal that produced maximum sustained yield could be as much as 56,000 sockeye salmon. However, the department adopted a biological escapement goal of only 16,000 sockeye salmon and recommended the Alaska Board of Fisheries also adopt this escapement level as the optimal goal to provide increased production without severely disrupting the recreational fishery. (Even with complete closure of the recreational fishery, an escapement of 56,000 sockeye salmon would only have been achieved in 5 of the last 27 years.) The Board of Fisheries amended the *Russian River Sockeye Salmon Management Plan* include a new optimal escapement goal of 16,000 sockeye salmon during their 1990 meeting; the amended plan took effect in 1991. This optimal goal was stated to be a minimal level of escapement. Therefore, while the recreational fishery may be restricted to reach this goal, bag limits are usually not increased if it appears the goal will be exceeded.

Appendix N.16
Russian River Late-Run Sockeye Salmon

Regulatory Area: Cook Inlet - Kenai Peninsula Area

Stock Unit: Russian River Late Run (sockeye salmon returning after 21 June)

Management Division: Sport Fish

Primary Fishery: Recreational

Biological Escapement Goal: 30,000 sockeye salmon (adopted early 1970s)

Optimal Escapement Goal: 30,000 sockeye salmon (adopted 1979)

In-River Goal: None

Action Points:

Less than 30,000 sockeye salmon (adopted 1979)	In-river sockeye salmon sport fishery closed

Escapement Enumeration Methods: Visual counts have been made at a weir since 1968. Visual counts were made from counting towers in 1963–1967.

History of Goal: An escapement goal of 30,000 sockeye salmon was established by the department in the early 1970s and adopted by the Alaska Board of Fisheries in 1979 as part of the *Russian River Sockeye Salmon Management Plan* (5 AAC 21.361). The biological escapement goal represents the average escapement count for 16 years: 1963–1978. These counts represent total escapement into this system and are expected to produce a high sustainable yield. Total runs to the Russian River since the early 1980s have been much greater than those documented in prior years, and average annual escapement since 1980 has been more than twice the optimal escapement goal adopted in 1979.

Appendix N.17
Susitna River Sockeye Salmon

Regulatory Area: Cook Inlet - Northern District

Stock Unit: Susitna River Drainage

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 200,000 sockeye salmon (adopted 1979; since 1986, the total Susitna goal is assumed to have been reached when 100,000 to 150,000 sockeye salmon enter the Yentna River)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Counts have been made since 1981 with single-beam hydroacoustic equipment, placed on both banks of the Yentna River at river mile 4, in conjunction with fish wheels. From 1979 to 1985, counts were made with single-beam hydroacoustic equipment placed on both banks of the Susitna River at Susitna Station. Mark/recapture estimates at Sunshine Station were done from 1982 to 1985.

History of Goal: The Susitna River escapement goal of 200,000 sockeye salmon was established in 1979 during comprehensive salmon development planning for Cook Inlet. It was set using a return-per-spawner value of 4 and the assumption the Susitna River could produce about 800,000 adult sockeye salmon. A review of the goal in 1989, based on euphotic volume of rearing lakes, suggested the existing goal was valid. In 1986, the counting site at Susitna Station was destroyed by flooding, and no alternative hydroacoustic site could be found on the mainstem of the Susitna. Therefore, Yentna River hydroacoustic counts were used as an index of total Susitna River escapement. Based on comparisons of estimates for the Yentna and the Susitna Rivers over 5 years, 1981–1985, it was decided that an escapement of 100,000 to 150,000 sockeye salmon into the Yentna River would usually result in a total escapement of at least 200,000 sockeye salmon into the entire Susitna drainage. This was based on the average proportion of the total Susitna River escapement which entered the Yentna River (48.7%) during the 5 years studied, as well as the range of annual proportions (41.0%–59.3%) for these 5 years.

Appendix O.1
Branch River Sockeye Salmon

Regulatory Area: Bristol Bay - Naknek/Kvichak District

Stock Unit: Branch (Alagnak) River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 185,000 sockeye salmon (range: 170,000 to 200,000; adopted 1973)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made during fixed-wing aerial surveys in 1955 and 1956 and since 1977. Visual counts were made from 1957 to 1976 from towers located on both banks of the Branch River above its confluence with the Kvichak River.

History of Goal: Published goals (in millions of sockeye salmon):

1961	unknown	1968	0.577	1975	0.185	1982	0.185	1989	0.185
1962	unknown	1969	0.160	1976	0.185	1983	0.185	1990	0.185
1963	unknown	1970	unknown	1977	0.185	1984	0.185	1991	0.185
1964	0.500	1971	unknown	1978	0.185	1985	0.185	1992	0.185
1965	0.400	1972	unknown	1979	0.185	1986	0.185	1993	0.185
1966	0.053	1973	0.185	1980	0.185	1987	0.185		
1967	0.300	1974	0.185	1981	0.185	1988	0.185		

Establishment of the current goal was based on results of Ricker model analyses of adult production data. This stock cannot be managed independently from the Kvichak River stock, so escapement estimates have been made after, rather than during, the fishing season since 1977.

Appendix O.2
Egegik River Sockeye Salmon

Regulatory Area: Bristol Bay - Egegik District

Stock Unit: Egegik River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 1,000,000 sockeye salmon (range: 800,000 to 1,200,000; adopted 1984)

Optimal Escapement Goal: None

In-River Goal: None

Action Points:

750,000 sockeye salmon (adopted 1992)	Cycle openings and closures to disperse sockeye salmon within district
1,500,000 sockeye salmon (adopted 1992)	Continuous commercial fishing may be allowed

Escapement Enumeration Methods: Visual counts have been made since 1957 from towers on both banks of the Egegik River below the Becharof Lake outlet. Visual counts were made at a weir on Egegik River in 1932 and from 1952 to 1956. Visual counts were made during fixed-wing aerial surveys from 1944 to 1951.

History of Goal: Published goals (in millions of sockeye salmon):

1961	unknown	1968	1.000	1975	0.600	1982	0.600	1989	1.000
1962	0.350	1969	0.400	1976	0.600	1983	0.600	1990	1.000
1963	0.850	1970	0.700	1977	0.600	1984	1.000	1991	1.000
1964	0.850	1971	1.000	1978	0.600	1985	1.000	1992	1.000
1965	1.000	1972	0.600	1979	0.600	1986	1.000	1993	1.000
1966	1.000	1973	0.600	1980	0.600	1987	1.000		
1967	1.000	1974	0.500	1981	0.600	1988	1.000		

Establishment of the current goal was based on results of Ricker model analyses of smolt and adult production data. The *Egegik District Allocation Plan* (5 AAC 06.365) was amended in 1992 to establish 2 action points, but neither an optimal nor an in-river goal was set.

Appendix O.3
Igushik River Sockeye Salmon

Regulatory Area: Bristol Bay - Nushagak District

Stock Unit: Igushik River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 200,000 sockeye salmon (range: 150,000 to 250,000; adopted 1983)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Method: Visual counts have been made since 1958 from towers set on both banks of the Igushik River below the Amanka Lake outlet.

History of Goal: Published goals (in millions of sockeye salmon):

1961	unknown	1968	0.150	1975	0.150	1982	0.150	1989	0.200
1962	0.060	1969	0.200	1976	0.150	1983	0.200	1990	0.200
1963	0.400	1970	0.200	1977	0.150	1984	0.200	1991	0.200
1964	0.250	1971	0.150	1978	0.150	1985	0.200	1992	0.200
1965	0.250	1972	0.150	1979	0.150	1986	0.200	1993	0.200
1966	0.200	1973	0.150	1980	0.150	1987	0.200		
1967	0.153	1974	0.150	1981	0.150	1988	0.200		

Establishment of the current goal was based on results of Ricker model analyses of adult production data.

Appendix O.4
Kvichak River Sockeye Salmon

Regulatory Area: Bristol Bay - Naknek/Kvichak District

Stock Unit: Kvichak River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 4,000,000 to 8,000,0000 sockeye salmon (annual goal varies by year within this range; adopted 1987)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made since 1955 from towers set on both banks of the Kvichak River below the Lake Iliamna outlet. Visual counts were made at a weir on the Kvichak River in 1932.

History of Goal: Published goals (in millions of sockeye salmon):

1961	unknown	1968	0.874	1975	14.000	1982	2.000	1989	8.000
1962	2.500	1969	6.000	1976	2.000	1983	2.000	1990	6.000
1963	0.750	1970	19.000	1977	2.000	1984	10.000	1991	4.000
1964	5.000	1971	2.500	1978	2.000	1985	10.000	1992	6.000
1965	8.000	1972	2.000	1979	6.000	1986	5.000	1993	5.000
1966	6.000	1973	2.000	1980	14.000	1987	5.000		
1967	3.500	1974	6.000	1981	2.000	1988	5.000		

Unlike other Bristol Bay systems, a cyclical pattern of goals with a period of 5 years was used from 1962 through 1984: the largest goal for the dominant run, the smallest goals for each of the 3 off-cycle runs, and a moderate goal for the subdominant run. Cycles in abundance were thought to result from a depensatory agent (e.g., predators) operating during the freshwater phase of the life cycle, since suitable spawning area was available for about 20,000,000 spawners. Beginning in 1978, cycle shifts and the occurrence of large runs during off-cycle years provided a stimulus for a multi-agency reevaluation of escapement goals. These studies suggested that any natural abundance cycles were greatly amplified by cyclic escapement goals. In 1985, a shift toward a single goal was begun by increasing off-cycle escapements and decreasing dominant and subdominant escapements.

Appendix O.5
Naknek River Sockeye Salmon

Regulatory Area: Bristol Bay - Naknek/Kvichak District

Stock Unit: Naknek River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 1,000,000 sockeye salmon (range: 800,000 to 1,400,000; adopted 1984)

Optimal Escapement Goal: None

In-River Goal: None

Action Points:

Greater than 800,000 sockeye salmon (adopted 1986)	Commercial fishing is allowed in Naknek River Special Harvest Area, if actions being taken in Naknek Section to decrease commercial harvest of Kvichak River sockeye salmon

Escapement Enumeration Methods: Visual counts have been made since 1957 from towers on both banks of the Naknek River below the Naknek Lake outlet. Visual counts were made at a weir on the Naknek River from 1930 to 1932 and from 1950 to 1956. Visual counts were made at a weir on the Brooks River during the 1940s and 1950s.

History of Goal: Published goals (in millions of sockeye salmon):

1961	unknown	1968	1.000	1975	0.800	1982	0.800	1989	1.000
1962	unknown	1969	1.000	1976	0.800	1983	0.800	1990	1.000
1963	0.750	1970	1.000	1977	0.800	1984	1.000	1991	1.000
1964	0.850	1971	0.900	1978	0.800	1985	1.000	1992	1.000
1965	0.800	1972	0.800	1979	0.800	1986	1.000	1993	1.000
1966	0.800	1973	0.800	1980	0.800	1987	1.000		
1967	1.000	1974	0.800	1981	0.800	1988	1.000		

Establishment of the current goal was based on results of Ricker model analyses of smolt and adult production data. Past studies have suggested that enough suitable spawning area was available to support about 1,340,000 spawners, a value similar to ones based on analyses of smolt and adult production data. The *Naknek River Sockeye Salmon Special Harvest Area Management Plan* (5 AAC 06.360), which took effect during the 1986 season, established a single action point for this stock.

Appendix O.6
Nushagak River Sockeye Salmon

Regulatory Area: Bristol Bay - Nushagak District

Stock Unit: Nushagak River (includes Mulchatna and Nuyakuk Rivers)

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 550,000 sockeye salmon (range: 340,000 to 760,000; adopted 1986)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Counts have been made since 1978 with single-beam hydroacoustic equipment set on both banks of the Nushagak River below Portage Creek, in conjunction with drift gillnet test fishing. Visual counts were made during fixed-wing aerial surveys from 1961 to 1985. Visual counts were made from towers set on both banks of the Nushagak River below Ekwok from 1966 to 1973, and from towers set on both banks of the Nuyakuk River below Tikchik Lake outlet from 1959 to 1988.

History of Goal: Published goals (in millions of sockeye salmon) for the Nuyakuk River:

1961	unknown	1968	0.200	1975	0.250	1982	0.250	1989	0.500
1962	0.030	1969	0.150	1976	0.250	1983	0.300	1990	0.500
1963	0.200	1970	0.214	1977	0.250	1984	0.300	1991	0.500
1964	0.100	1971	0.132	1978	0.250	1985	0.300	1992	0.500
1965	0.200	1972	0.071	1979	0.250	1986	0.500	1993	0.500
1966	0.150	1973	0.150	1980	0.250	1987	0.500		
1967	0.080	1974	0.250	1981	0.250	1988	0.500		

Published goals (in millions of sockeye salmon) for the Nushagak-Mulchatna River:

1961	unknown	1968	unknown	1975	0.040	1982	0.040	1989	0.050
1962	unknown	1969	unknown	1976	0.040	1983	0.050	1990	0.050
1963	0.020	1970	unknown	1977	0.040	1984	0.040	1991	0.050
1964	0.010	1971	unknown	1978	0.040	1985	0.040	1992	0.050
1965	unknown	1972	unknown	1979	0.040	1986	0.050	1993	0.050
1966	unknown	1973	0.045	1980	0.040	1987	0.050		
1967	unknown	1974	0.080	1981	0.040	1988	0.050		

Most sockeye salmon production within this drainage occurs within the Nuyakuk River and Tikchik Lakes. Nuyakuk River goals were based on results of Ricker model analyses of smolt and adult production, while Nushagak-Mulchatna goals were based on visual analysis of limited adult data. Since sockeye salmon returning to the drainage cannot be managed independently, the department decided, in 1989, to manage the entire run for a single biological escapement goal and to only monitor total escapement passing the

mainstem Nushagak River hydroacoustic site. The current goal was obtained by combining existing goals for the Nuyakuk and Nushagak-Mulchatna areas. Future goal evaluation will be done using total drainage escapement and return data, which is now available beginning with the 1976 brood year.

Appendix O.7
Togiak River Sockeye Salmon

Regulatory Area: Bristol Bay - Togiak District

Stock Unit: Togiak River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 150,000 sockeye salmon (range: 140,000 to 250,000; adopted 1984)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made since 1960 from towers on both banks of the Togiak River below the Togiak Lake outlet. Visual counts of Togiak River tributaries have been made during fixed-wing aerial surveys since 1953.

History of Goal: Published goals (in millions of sockeye salmon; not including Togiak River tributaries):

1961	unknown	1967	0.090	1973	0.080	1979	0.100	1985	0.150	1991	0.150
1962	0.080	1968	0.110	1974	0.100	1980	0.100	1986	0.150	1992	0.150
1963	0.100	1969	0.100	1975	0.100	1981	0.100	1987	0.150	1993	0.150
1964	0.100	1970	0.100	1976	0.100	1982	0.100	1988	0.150		
1965	0.150	1971	0.115	1977	0.100	1983	0.100	1989	0.150		
1966	0.120	1972	0.070	1978	0.100	1984	0.150	1990	0.150		

Establishment of the current goal was based on results of Ricker model analyses of adult production for Togiak River/Lake spawners. Production estimates for Togiak River/Lake spawners are somewhat inflated since the goal does not include estimates of Togiak tributary spawners. Tributary spawners are not counted during the season since all of the Togiak District harvest is attributed to Togiak River/Lake spawners.

Appendix O.8
Ugashik River Sockeye Salmon

Regulatory Area: Bristol Bay - Ugashik District

Stock Unit: Ugashik River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 700,000 sockeye salmon (range: 500,000 to 900,000; adopted 1984)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made from towers since 1957 on both banks of the Ugashik River below the lower Ugashik Lake outlet. Visual counts were made at a weir on the Ugashik River from 1926 to 1932 and from 1949 to 1956.

History of Goal: Published goals (in millions of sockeye salmon):

1961	unknown	1968	0.750	1975	0.500	1982	0.500	1989	0.700
1962	0.750	1969	0.400	1976	0.500	1983	0.500	1990	0.700
1963	0.650	1970	0.700	1977	0.500	1984	0.700	1991	0.700
1964	0.600	1971	0.500	1978	0.500	1985	0.700	1992	0.700
1965	0.800	1972	0.450	1979	0.500	1986	0.700	1993	0.700
1966	0.850	1973	0.188	1980	0.500	1987	0.700		
1967	0.850	1974	0.500	1981	0.500	1988	0.700		

Establishment of the current goal was based on results of Ricker model analyses of smolt and adult production data.

Appendix O.9
Wood River Sockeye Salmon

Regulatory Area: Bristol Bay - Nushagak District

Stock Unit: Wood River

Management Division: Commercial Fisheries Management and Development

Primary Fishery: Commercial Set and Drift Gillnet

Biological Escapement Goal: 1,000,000 sockeye salmon (range: 700,000 to 1,200,000; adopted 1983)

Optimal Escapement Goal: None

In-River Goal: None

Action Points: None

Escapement Enumeration Methods: Visual counts have been made from towers since 1953 that were set on both banks of the Wood River below the Lake Aleknagik outlet. Visual counts were made at a weir on Wood River from 1908 to 1919.

History of Goal: Published goals (in millions of sockeye salmon):

1961	unknown	1968	1.000	1975	0.800	1982	0.800	1989	1.000
1962	0.450	1969	0.750	1976	0.800	1983	1.000	1990	1.000
1963	1.200	1970	1.000	1977	0.800	1984	1.000	1991	1.000
1964	0.900	1971	0.750	1978	0.800	1985	1.000	1992	1.000
1965	0.500	1972	0.750	1979	0.800	1986	1.000	1993	1.000
1966	0.900	1973	0.700	1980	0.800	1987	1.000		
1967	1.100	1974	0.800	1981	0.800	1988	1.000		

Establishment of the current goal was based on results of Ricker model analyses of smolt and adult production data. Since other studies have suggested that enough suitable spawning area was available to support about 3,000,000 spawners, production from this system appears to be limited by rearing capacity as well as by an annual variability in the distribution of spawners. In past years, the department has attempted to obtain escapements toward the lower end of the range when the spawning population was 60% or more age-.3 sockeye salmon and toward the upper end of the range when the spawning population was 60% or more age-.2 sockeye salmon. This was done to avoid overcrowding riverine spawning areas between lakes in the drainage and allowing full utilization of lacustrine spawning areas. Populations in riverine spawning areas were historically comprised of high proportions of age-.3 sockeye salmon, while populations in lacustrine spawning areas were historically comprised of high proportions of age-.2 sockeye salmon. The relationship between age composition and spawning requirements needs to be reexamined, however, since a larger proportion of age-.3 sockeye salmon has begun to spawn in other areas of the system.